Illinois U Library

volume 43 number 11

november 1955

the
institute
of
radio
engineers

Proceedings of the IRE

URE TRANSMITTER AIDS MEDICAL RESEARCH

IN THIS ISSUE

ABC'S OF COLOR TELEVISION
ELECTRONICALLY CONTROLLED AUDIO FILTERS
SIGNAL-SEEKING RADIO CIRCUIT
IRE STANDARDS ON FEEDBACK SYMBOLS
IRE STANDARDS ON PULSES
CASCADE BACKWARD-WAVE AMPLIFIER
TRANSISTOR BLOCKING OSCILLATORS
SHORT NOISE IN DIODES AND TRANSISTORS
MULTIPLE FREQUENCY SHIFT TELETYPE
SKIP RANGE ANTENNA
MICROWAVE PHASE SHIFTER
RADIO METER CIRCUITS
MAGNETIC FIELDS IN FERRITE BODIES
TRANSACTIONS ABSTRACTS
ABSTRACTS AND REFERENCES

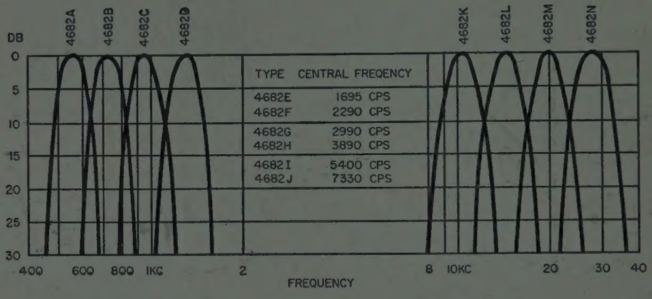
OUR MILLIONTH FILTER SHIPPED THIS YEAR...

FILTERS

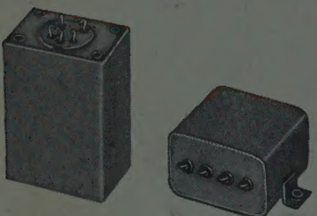
FOR EVERY APPLICATION

TELEMETERING FILTERS

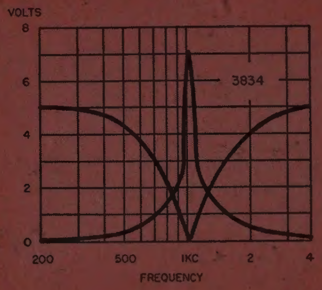
UTC manufactures a wide variety of band pass filters for multi-channel telemetering. Illustrated are a group of filters supplied for 400 cycle to 40 KC service. Miniaturized units have been made for many applications. For example a group of 4 cubic inch units which provide 50 channels between 4 KC and 100 KC.

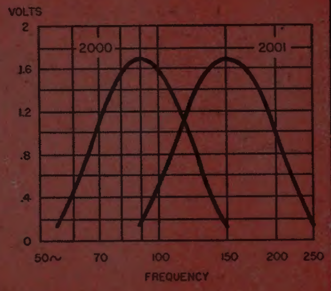


Dimensions:
(4682A) 1½ x 2 x 4″



Dimensions:
(3834) 1¼ x 1¾ x 2-3/16″.
(2000, 1) 1¼ x 1¾ x 1⅝″.





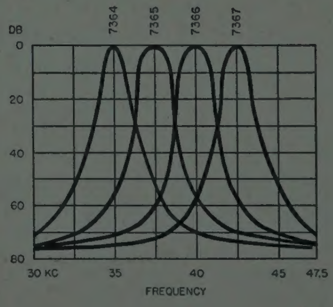
AIRCRAFT FILTERS

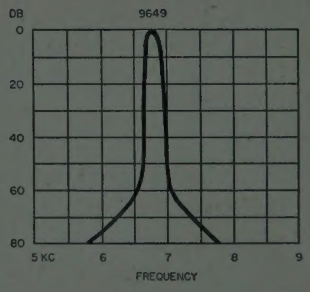
UTC has produced the bulk of filter used in aircraft equipment for ove a decade. The curve at the left i that of a miniaturized (1020 cycles range filter providing high attenua tion between voice and range fre quencies.

Curves at the right are that of ou miniaturized 90 and 150 cycle filter for glide path systems.

CARRIER FILTERS

A wide variety of carrier filters are available for specific applications. This type of tone channel filter can be supplied in a varied range of band widths and attenuations. The curves shown are typical units.

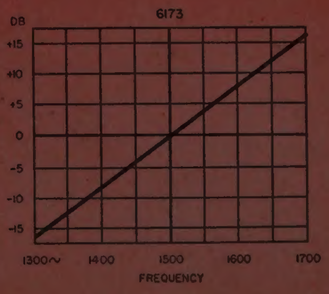


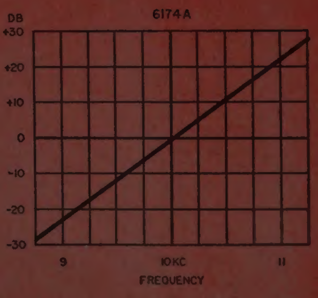


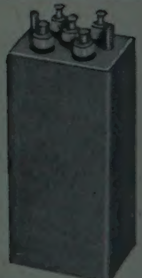
Dimensions:
(7364 series) 1⅝ x 1⅝ x 2¼″.
(9649) 1½ x 2 x 4″.

DISCRIMINATORS

These high Q discriminators provide exceptional amplification and linearity. Typical characteristics available are illustrated by the low and higher frequency curves shown.





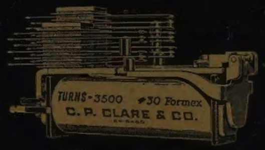


Dimensions:
(6173) 1-1/16 x 1⅜ x 3″.
(6174A) 1 x 1¼ x 2¼″.

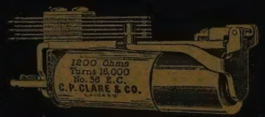
For full data on stock UTC transformers, reactors, filters, and high Q

UNITED TRANSFORMER CO

Stability and Reliability make CLARE Relays and Stepping Switches ideal components for DASAC



Clare Type A, Fast-operate—fast-release relay . . . for a.c. operation.



Clare Type D, slow-operate relay . . . for d.c. operation.

Clare Type 26 spring driven stepping switch. Used with 10 levels in DASAC control center.

● Pushbutton control center of the DASAC warehousing and assorting system makes use of over a hundred CLARE Type A and D relays and CLARE 10 level, 26 point stepping switches.

This device, which speeds and simplifies order picking operations, was developed by New York's Dasol Corporation, consulting engineers, to facilitate the warehouse operations of their client, Judy Bond, Inc., large blouse manufacturer.

The DASAC Control Center performs three basic functions. These include selection of container destination, "memorizing" the selections in consecutive order and coordinating the information to stop the container at its proper discharge point. "Relay requirements," said Sol Tanne, Dasol Chief Engineer, "above all, demanded stability and reliability. They had to be fast-acting, quiet, stable telephone-type relays which could easily be replaced if necessary."

Ability of CLARE Relays to perform millions—in some cases billions—of trouble-free operations has made them increasingly in demand as reliable components for today's high speed devices. If your design calls for long-life, high-quality relays or stepping switches, it will pay you to bring your problem to CLARE. Experienced field engineers are located near you. Contact them or call C. P. Clare & Co., 3101 Pratt Blvd., Chicago 45, Illinois. In Canada: Canadian Line Materials, Ltd., Toronto 13. Cable Address: CLARELAY.

DASAC Push Button Control Center which uses Clare relays and stepping switches in automatic control of warehouse assorting system.

Rear view of panel shows Clare relays, provided with dust tight covers, accessible for quick inspection and maintenance.

CLARE RELAYS

FIRST in the industrial field

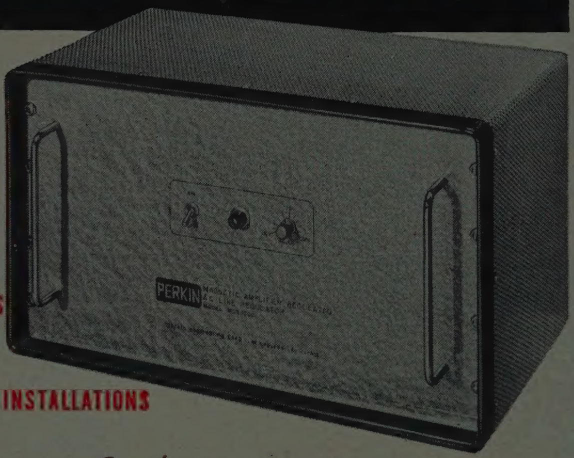
PERKIN
ANNOUNCES
PERKIN
power supplies

IMMEDIATE DELIVERY

on a NEW TUBELESS!

MAGNETIC AMPLIFIER

AC LINE
VOLTAGE REGULATOR



MODEL MLR - 1000

1 KVA

☆ NO TUBES TO REPLACE

☆ NO MOVING PARTS

☆ NO VIBRATING CONTACTS

☆ REGULATES RMS VALUE

☆ IDEAL FOR UNATTENDED INSTALLATIONS

Specifications...

- Input Voltage Range: 95 to 135 volts
- Output Voltage: Nominal 115 volts. can be adjusted from 110 to 120 volts.
- Output Current: 8.5 amperes
- Regulation Accuracy: ±0.25% for any combination of line or load
- Frequency Range: 60 cycles ±10%
- Wave Form Distortion: 3% maximum
- Power Factor Range: 0.5 lagging to 0.9 leading
- Response Time: 0.2 sec.
- Maximum Load: 1.0 KVA
- Ambient Temperature Range: Up to 45° C.
- Dimensions: 19½" wide x 11" high x 11½" deep (cabinet)
  19" wide x 10½" high x 11½" deep (rack panel)
- Mounting: Cabinet or 19" Rack Panel
- Finish: Gray Hammertone
- Weight: 85 lbs.

PERKIN
power supplies

WIRE COLLECT TODAY for PRICE QUOTATIONS!

Write for Bulletin MLR 1000

PERKIN ENGINEERING CORP.

345 KANSAS ST. EL SEGUNDO, CALIF. PHONE: OREGON 8-7215

Meetings with Exhibits

● As a service both to Members and the industry, we will endeavor to record in this column each month those meetings of IRE, its sections and professional groups which include exhibits.

Δ

Nov. 3-4, 1955

Annual Electronics Conference, Kansas City Section, Town House Hotel, Kansas City, Kans.

Exhibits: Mr. Charles V. Miller, Bendix Aviation Corp., P.O. Box 1159, Kansas City 41, Mo.

Nov. 7-9, 1955

Eastern Joint Computer Conference (IRE-AIEE-ACM), Hotel Statler, Boston, Mass.

Exhibits: Mr. J. D. Porter, Digital Computer Lab., Barta Building, M.I.T., Cambridge, Mass.

Nov. 21-22, 1955

IRE Symposium on Aeronautical Communications—Civil and Military, Hotel Utica, Utica, New York.

Exhibits: R. H. Reynolds, 15 Kenyon Court, Utica, New York.

Nov. 28-30, 1955

Instrumentation Conference & Exhibit, Atlanta Biltmore Hotel, Atlanta, Ga.

Exhibits: Mr. W. B. Wrigley, Engineering Experiment Station, Georgia Institute of Technology, Atlanta, Ga.

December 12-16, 1955

EJC Nuclear Science and Engineering Congress, Cleveland, Ohio

Exhibits: Engineers Joint Council, 33 W. 39th St., New York, N.Y.

Feb. 9-11, 1956

Eighth Annual Southwestern IRE, Conference and Electronics Show, Municipal Auditorium, Oklahoma City, Okla.

Exhibits: Mr. M. W. Thomas, P.O. Box 764, Oklahoma City, Okla.

March 19-22, 1956

IRE National Convention and Radio Engineering Show, Waldorf-Astoria Hotel and Kingsbridge Armory and Palace, New York, N.Y.

Exhibits: Mr. William C. Copp, Institute of Radio Engineers, 1475 Broadway, New York 36, N.Y.

Note on Professional Group Meetings: Some of the Professional Groups conduct meetings at which there are exhibits. Working committeemen on these groups are asked to send advance data to this column for publicity information. You may address these notices to the Advertising Department, and of course listings are free to IRE Professional Groups.

BREAKDOWNS COST PLENTY

The price of capacitors is very small compared to that of the complex equipment they are used in. The smallest trouble in the functioning of a capacitor — instability, penetration of humidity, or even sudden breakdown of a dielectric too sparingly designed — causes important disturbances which often can be found out only by a long study. This can be still more expensive if instead of staying in the home country, the equipment has been shipped overseas or sent to a foreign country. In this case a visit of Engineers and technical people is necessary.

Using cheap capacitors with insufficient dielectric thickness is not a real saving. Take insurance against repair expenses by choosing STEAFIX silvered mica capacitors. Absolutely stable, totally damp-proof, liberally designed, STEAFIX capacitors give you years of service life without trouble and thus prove not only the best but also the most economical.

STEAFIX capacitors resist time and weather

USE A GOOD CONDENSER
AND YOU WON'T WASTE
YOUR MONEY ON REPAIRS

STÉAFIX

Société Anonyme au capital de 65.000.000 de Francs
17, RUE FRANCŒUR, PARIS 18e - FRANCE
TÉL. MONTmartre 02-93

the european specialist of the mica capacitors

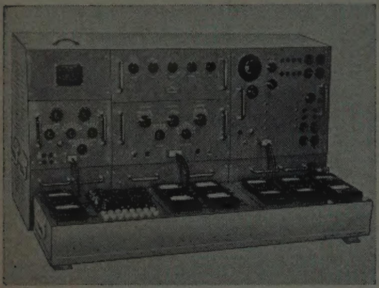
PUBLICITÉ SOFEL PARIS

NEWS and NEW PRODUCTS

November 1955

Meter Calibrator

An electric meter calibrator suitable for checking all the usual electric meters is now available from **National Instrument Laboratories, Inc.,** 6108 Rhode Island Ave., Riverdale, Md. The unit consists of a power supply panel which has the various required test outputs and an instrument console including twelve precision meters used as standards for comparison with the meters under test.



The power supply requires an input of 110 volts, 60 cps at a maximum current of approximately 5 amperes. Multiple outputs from the power supply provide for calibration of meters in the following ranges: dc voltmeters, 0.1 to 2,000 volts; dc ammeters, 100 microamperes to 100 amperes; ac voltmeters, 1.5 mv to 1500 volts; ac ammeters, 0.1 ampere to 100 amperes. Meters can be tested over the frequency range from 60 to 800 cps. Single and three phase outputs are available for testing wattmeters, varmeters, and power factor meters having 110, 220, or 440 volts potential circuits at frequencies of 60 and 400 cps. Synchronization indicators having 110, 220 or 440 volts potential circuits can be tested at 60 cps.

The console is equipped with No. 610 Weston meters. It is also provided with a wheatstone bridge for checking multiplier resistors and with resistors from 10 ohms to 100 megohms for calibrating ohmeters.

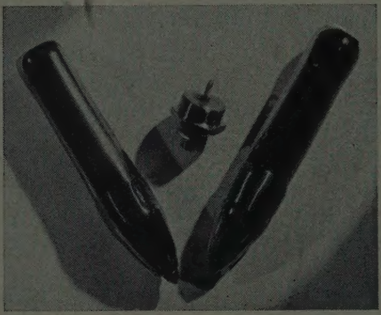
The overall dimensions of the calibrator are 48×28×26 inches high. The unit weighs approximately 500 pounds.

1956 Radio Engineering Show
March 19-22, 1956
Kingsbridge Armory and Palace
New York

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your affiliation.

Silicon Rectifiers

Newly available power silicon diodes, capable of handling kilowatts of power, are available from **Semiconductor Dept., Westinghouse Electric Corp.,** 360 Collins Ave., Pittsburgh, Pa. The two outstanding advantages of fused silicon diodes are the phenomenally high efficiencies even in low-voltage systems and the ability to operate at temperatures from −65°C up to 190°C.



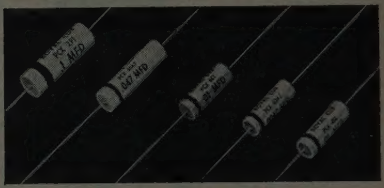
These new diodes have a typical drop of only 0.7 volts at a current of 8 amperes and at a cell temperature of 190°C. The rating of the new WN-5051 rectifier, when mounted in a finned case 1 inch high and 1½ inches in diameter and having natural convection cooling with a 65°C ambient, is 15 amperes at 200 volts peak inverse.

An obvious advantage for military applications is the fact that silicon can be operated with only moderate deratings at ambients of 180°C.

At present, four voltage classifications are available: 50, 100, 150 and 200 volts. They have a forward current rating of 8 amperes with natural convection cooling in ambient air at 25° C. Higher current ratings up to 40 amperes can be achieved with forced cooling.

Paper Tubular Capacitors

Cornell-Dubilier Electric Corp., South Plainfield, N. J., announces immediate availability of its new ROYAL CUB paper-dielectric capacitor designed to combine advantageous new electrical features for high temperature and high stability operation with exceptional mechanical toughness and long-life characteristics achieved by the use of Polykane, a solid thermosetting compound developed by C-D Engineers.



The Polykane-impregnated capacitor sections operate over a temperature range of −55°C to +100°C at full-rated voltage. Average capacitance-temperature variation is 5 per cent from the 25°C value. Insulation resistance at 25°C exceeds 4,000 megohms-μf, with power factor less than 1 per cent.

These capacitors are available in 100, 200, 400, 600, and 1,000 volts dc working, and capacitances from 0.001 to 1.0 μf, depending on voltage.

Engineering Bulletin #170, a four-page comprehensive description with completely illustrated specification data, may be obtained from the company.

Swanson and Jester Appointed by Standard Coil

Standard Coil Products Co., 2085 N. Hawthorne, Melrose Park, Ill., manufacturers of Television tuners and replacement parts, recently announced two major changes in personnel. C. A. Swanson, left, former sales manager of the West Coast Division of the firm, was named general sales manager and Oden F. Jester, right, former jobber sales manager, has been appointed assistant general sales manager.

(Continued on page 36A)

Size has nothing to do with accomplishment

Inside these fully encapsulated miniature precision wire wound resistors, Daven furnishes the solution to problems presented by space limitations. A new winding technique permits the use of extremely fine sizes of resistance wire to obtain two or three times the resistance value previously supplied on a miniature bobbin. This new development more firmly establishes DAVEN'S leadership in the field of miniature and standard size precision wire wound resistors.

Types and Specifications

Type	Dia.	Length	Max. Res.	Wattage Rating	Terminals
1273	1/4	5/16	400K	.1	One End #22 Gauge
1283	1/4	5/16	400K	.1	Axial #22 Gauge
1274	3/16	3/8	100K	.1	Axial #22 Gauge
1284	1/4	27/64	.5 Meg.	.25	One end #20 Gauge
1192	1/4	1	1.0 Meg.	.75	Axial #22 Gauge

- Fully encapsulated.
- Meet and exceed all humidity, salt water immersion and cycling tests as specified in MIL-R-93A, Amendment 3.
- Operate at 125°C continuous power without de-rating.
- Can be obtained in tolerances as close as ±0.05%.
- Standard temperature coefficient is ±20PPM/°C.

Special coefficients can be supplied on request.

For maximum resistance in minimum space:

Daven's new winding technique cuts giants down to size

THE DAVEN CO.

528 West Mt. Pleasant Ave.
Route 10, Livingston, N. J.

Write for complete resistor catalog.

Oregon Electronics
Model PR 300

PRECISION REGULATED

✓ STABILITY
(Long term ±100 ppm—
Short term ±50 ppm per hour)
✓ LOW RIPPLE
✓ LOW IMPEDANCE

Here's a voltage reference that can be depended upon for many laboratory functions, but specifically suited for calibrating meters, powering multi-stage amplifiers and computers.

OUTPUT TOLERANCE for 10% line voltage variation: ± .002% or less.

VOLTAGE RELIABILITY read on decade dials: .02% or 5 millivolts, whichever is greater.

OUTPUT VOLTAGES: (1) 10 to 310 volts in 1 volt steps @ 150 ma. max. (2) 0-150 volts continuously variable @ 5 ma. max. (3) 6.3 volts unregulated @ 3 amperes CT.

Oregon Electronics
Model 32V15A

CLOSELY REGULATED

✓ Low Voltage—High Current
✓ DC POWER SUPPLY

A Magnetic Amplifier Power Supply with output at 15 amperes continuously variable from 5 to 32 volts without switching.

REGULATION: ±1% from no load to full load. ±1% from 105 to 125 volts input.

RIPPLE VOLTAGE: 1% RMS @ 32 volts and full load, increasing to 2% @ 5 volts and full load.

Complete specifications and details upon request—write or wire today.

Oregon Electronics
2232 EAST BURNSIDE STREET
PORTLAND 15, OREGON
BElmont 6-9292

MANUFACTURERS OF SPECIAL ELECTRONIC EQUIPMENT

News-New Products

(Continued from page 34A)

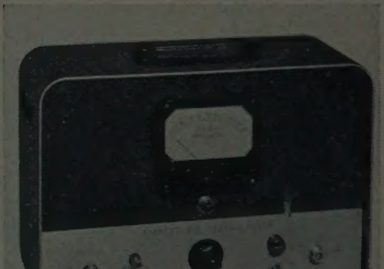
Silicon Area Rectifiers

Silicon Corp. of America, 120 Austin Blvd., Island Park, L. I., N. Y., has available a new 4-page brochure. It lists the complete electrical specifications, mechanical dimensions, and illustrates three new silicon junction rectifiers.

Type P is designed for medium power applications. It carries 500 milliamperes of rectified forward current. Type S is similar to P, with one pigtail replaced by a steel for attaching unit to an external heat sink. This enables the type S to handle four times the power of P. The type B-D is used in high power applications of up to 10 kw. This component can carry forward currents up to 25 amperes.

Amplitude Modulator

An Amplitude Modulator designated the Model 115 has been announced by **Measurements Corp.,** Boonton, N. J., a subsidiary of Thomas A. Edison, Inc. Operating over a frequency range of 0.1 to 50 mc with external modulation frequencies of 30 cps to 15 kc, it provides 100 per cent amplitude modulation with low envelope distortion, and negligible incidental frequency modulation.

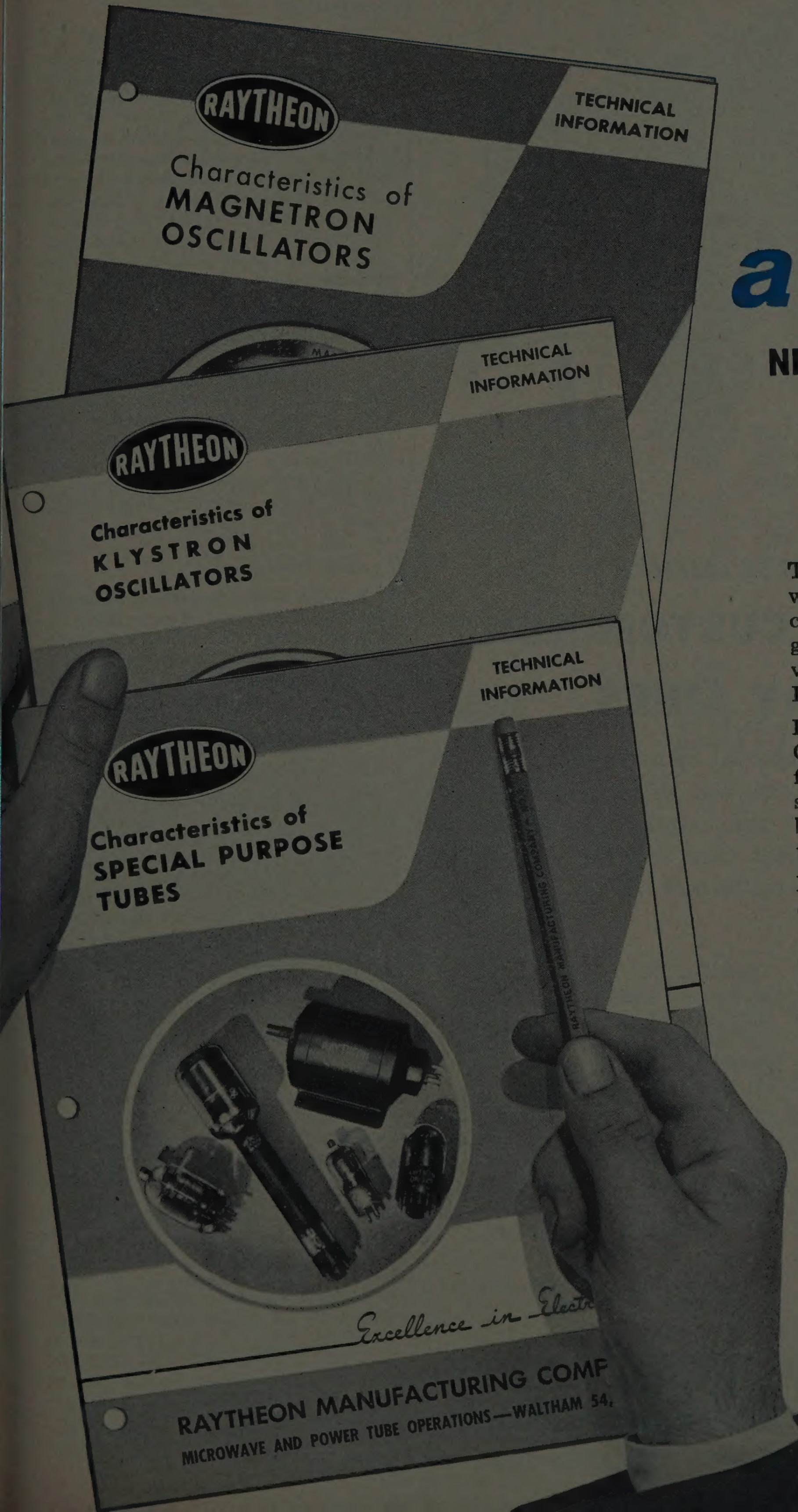


The instrument is designed for making measurements on systems requiring up to 100 per cent modulation and on narrow band receivers where incidental FM cannot be tolerated. It may be used with any conventional AM or FM signal generator and an audio oscillator capable of producing approximately 10 volts across 100,000 ohms. The instrument weighs 15 pounds.

Additional information may be obtained from the company.

(Continued on page 89A)

Raytheon — World's Largest Manufacturer of Magnetrons and Klystrons


RAYTHEON
Characteristics of MAGNETRON OSCILLATORS
TECHNICAL INFORMATION
RAYTHEON
Characteristics of KLYSTRON OSCILLATORS
TECHNICAL INFORMATION
RAYTHEON
Characteristics of SPECIAL PURPOSE TUBES
TECHNICAL INFORMATION
Excellence in Electr
RAYTHEON MANUFACTURING COMP
MICROWAVE AND POWER TUBE OPERATIONS—WALTHAM 54,

now available

NEW Consolidated Data Booklets for Raytheon Magnetrons, Klystrons and Special Tubes

WRITE FOR YOUR COPIES

These valuable free data booklets, which we will be glad to send you, list most of the principal unclassified types manufactured. They give maximum ratings, typical operating values, frequency ranges, and power levels. Indispensable to every engineer's file.

Raytheon is the world's largest producer of CW and pulse magnetrons, available in either fixed or tunable designs. A compact, efficient source of microwave power, magnetrons are being used in a growing number of applications.

Raytheon klystrons, which can be tuned mechanically or thermally, fit the widest range of requirements from 550 to 60,000 Mc.

The special tubes include backward wave oscillators, square law tubes, storage tubes and others.

Write today for your data booklets—or telephone WAltham 5-5860. There is no obligation, of course.

Excellence in Electronics RAYTHEON

RAYTHEON MANUFACTURING COMPANY

Microwave and Power Tube Operations,
Section PT-35, Waltham 54, Mass.

Raytheon makes: Magnetrons and Klystrons, Backward Wave Oscillators, Traveling Wave Tubes, Storage Tubes, Power Tubes, Receiving Tubes, Transistors

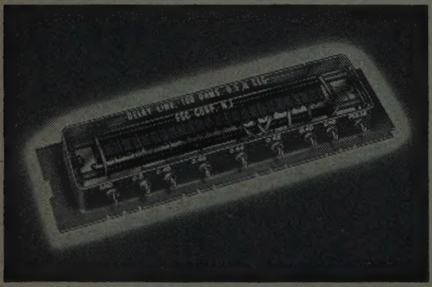
the laboratory report accompanying our delay line prototype always surprises our *new* customers

our old customers take this additional engineering service for granted

Prototype Lab Reports assure - -

DEPENDABLE, CUSTOM-BUILT ESC DELAY LINES

Every ESC prototype is accompanied by a Laboratory Report which includes your submitted electrical requirements, photo-oscillograms, which indicate input and output pulse shape and output rise-time; the test equipment used and our conclusions which evaluate the electrical characteristics of the prototype. There's no margin for error!



CONSULT ESC for the most economical solution to your delay line problem.

Typical of ESC custom-built units is #11-12. Design features and specifications include: *Impedance:* 100 ohms; *Delay:* .5 μsec.; *Rise Time:* .035 μsec.; *Attenuation:* 0.1 db; *Thermal Stability:* 0.00005 μsec. per μsec. per degree Centigrade delay change; *Spurious:* low cross talk in minimum space; *Temperature:* efficient operation from —55°C to +125°C; *Phase Shift:* linear; *Meets all applicable mil-specs.*

WRITE ESC for an informative catalog and complete information.

ESC CORPORATION

538 Bergen Boulevard, Palisades Park, New Jersey

Industrial Engineering Notes*

AERONAUTICS

The Defense Department has announced the lifting of security classification "Confidential" from the air navigation system known as TACAN, Tactical Air Navigation System, developed by the Navy to satisfy urgent military requirements for accurate and flexible navigation support of modern carrier and land-based aircraft. This action by the Defense Department is the result of an announcement last April by the Air Coordinating Committee that TACAN should become the common system for air navigation and thus replace the VOR/DME system, and the subsequent report by the House Interstate and Foreign Commerce Committee which concurred with this recommendation. Last February the Air Navigation Development Board issued a report in which it announced that TACAN was under consideration to replace the VOR/DME system. Technical details of the TACAN system were recently made available by the Air Navigation Development Board.

FEDERAL PERSONNEL

F. Ralph Ketter, formerly an Assistant Professor of Electrical Measurements at MIT, has rejoined the staff of the National Bureau of Standards, as a member of the Resistance and Reactance Section of the Electricity and Electronics Division. For five years prior to 1947, Dr. Ketter was engaged in electronic ordnance development at NBS.

INDUSTRY STATISTICS

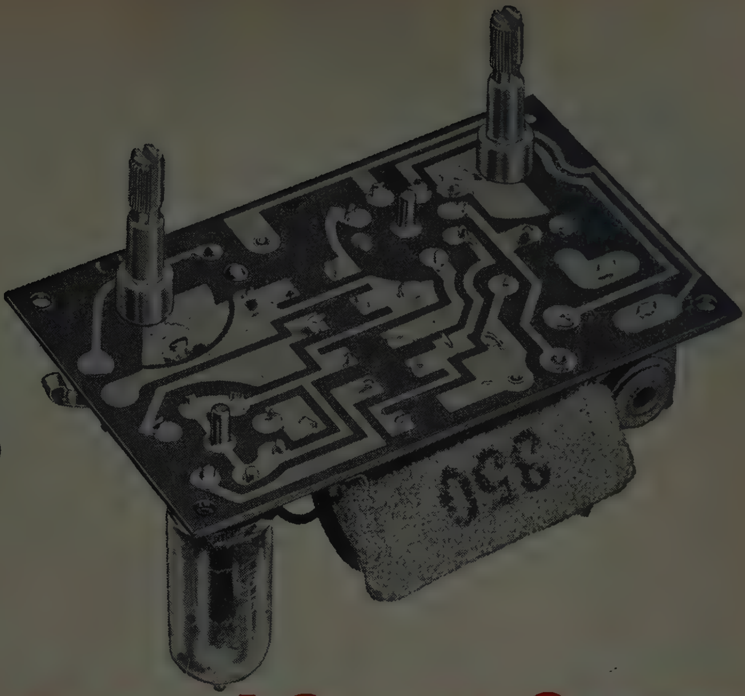
The Census Bureau, Commerce Department has released figures showing the results of a survey conducted by the Bureau to determine the number of television sets in the country's households, obtained at the request of the Advertising Research Foundation and in conjunction with the June, 1955 enumeration of the Current Population Survey. The results of the survey show that more than six times as many households had TV sets in June, 1955 than in April, 1950, the first time that a question on television was included in a census of housing. Survey results also show that about 32 million or 67 per cent of the households enumerated in June had one or more television sets, whereas in 1950 there were about five million households with television sets, or 12 per cent of the total. RETMA figures show that 39,029,110 TV sets have been sold to the public through June, 1955. It should be emphasized that the Census Bureau estimates are not relative to the number of sets in use since the estimates do not include second-set homes

(Continued on page 40A)

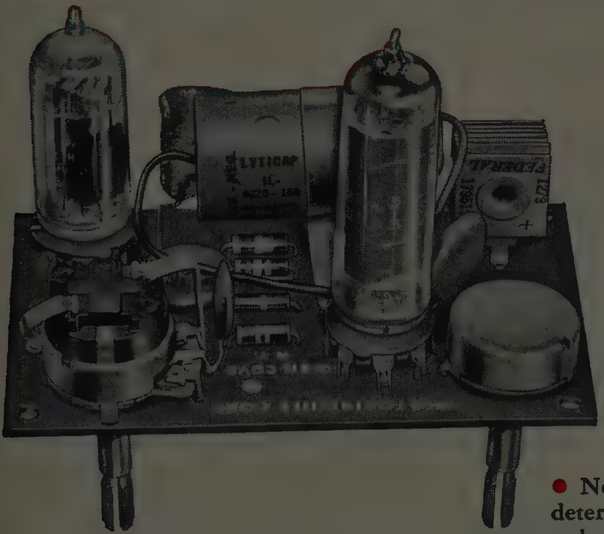
---

* The data on which these NOTES are based were selected by permission from *Industry Reports*, issues of August 15, 22, 29, and September 6, published by the Radio-Electronics-Television Manufacturers Association, whose helpfulness is gratefully acknowledged.

Speed up production with



REVERE ROLLED Printed Circuit Copper



Audio amplifier unit by Photocircuits Corp., Glen Cove, N. Y., using Revere Rolled Printed Circuit Copper.

Available NOW!

- Now that Revere *Rolled* Printed Circuit is available, nothing need deter you from switching to printed circuitry. This copper is supplied to laminators in standard coils of 350 lbs., in widths up to 38″, and in .0015″ and .0027″ gauges, weighing approximately 1 oz. and 2 oz. per square foot.

High in conductivity, uniformly dense through and through and side to side, Revere *Rolled* Printed Circuit Copper is easily etched and soldered.

When ordering blanks from your laminator, specify Revere *Rolled* Printed Circuit Copper.

REVERE
COPPER AND BRASS INCORPORATED
Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere.

OUR SERVO MOTORS
ARE HIGH-TEMPERATURE
AND CORROSION-RESISTANT

E-P Servo Motors are designed and built to meet specifications for high-temperature operation . . . corrosion can't touch 'em either, for they're completely resistant to humidity and salt spray.

If you're concerned about maintaining optimum performance under unusual conditions, find out about E-P Servo Motors.

Write, wire or call us for information on standard and special types . . . prices . . . and deliveries. ECLIPSE-PIONEER DIVISION, BENDIX AVIATION CORPORATION, TETERBORO, N. J.

Eclipse-Pioneer
DIVISION

Bendix
AVIATION CORPORATION

West Coast Office: 117 E. Providencia, Burbank, Calif. • Export Sales: Bendix International Division, 205 E. 42nd St., New York 17, N.Y.

Industrial Engineering Notes

(Continued from page 38A)

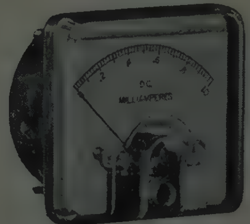
and since the Bureau's term "household" does not include transient residences, such as hotels or other business establishments.

A more detailed analysis of the results of the survey was released in mid-September, according to Census Bureau officials.

MOBILIZATION

To coordinate the activities of the military services, to avoid duplication, and to centralize activity, the Department of Defense established an Electronic Test Equipment Coordination Group. It will be under the purview of the Assistant Secretaries of Defense (R&D) and (AE). The objective of the group is to assist the Joint Coordinating Committee on Electronics in achieving a sound, coordinated and integrated technical program in the field of electronic test equipment. The group will serve as one central point of activity regarding electronic test equipment, thus establishing one focal point of information. It will be on a par with the Advisory Group on Electron Tubes and the Advisory Group on Electronic Parts. The membership will include one member and a deputy designated by the Secretary of each of the three military departments and

(Continued on page 42A)



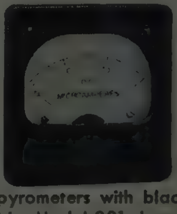
Electrical Indicating
Panel Meters and Pyrometers

Model 261 shown, Price $11.50
White-face, Black-face, or Colored Dials. Can be calibrated in any units: (Amps, KV, FPM, Angstrom Units)

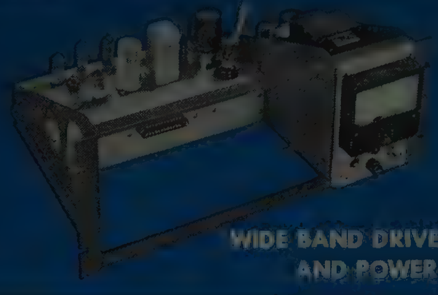
Pyrometers are medium resistance (4 ohms per millivolt). Accuracy 2%. Automatic, bimetal cold junction correction. Compensated for copper error. (Ranges from −400 to +3000°F.)

Large dial area—clearly visible. Less waste panel space. Easily lighted transparent plastic front and case. Anti-static treated. Tubing pointer normally supplied. Knife-edge and other types available. D'Arsonval movement in Alnico permanent magnet. Snap-fit construction, virtually dust-tight case. AC meters are rectifier type. Model 451 is 4½"; Model 351 is 3½"; Model 261 is 2½". Meters with Zero Right, Zero Center or up to two-thirds of range suppressed can be supplied. AC and DC in multiple ranges. Meter ranges: DC or AC 0/20 Microamps to 0/50 Amps. 0/5 Millivolts to 0/500 Volts. (Minimum AC Range 0/250 Millivolts). Panel meters and pyrometers with black Bakelite cases also available. Model 301 shown. Write for Bulletin G-9 Assembly Products, Inc., Chesterland 2, Ohio. Phone: (Cleveland, O.) HAmilton 3-4436.

Atomic Exposition, Booth 423, Dec. 10-16, Cleveland, Ohio



SEPARATE COMPONENTS



SANBORN OSCILLOGRAPHIC RECORDING EQUIPMENT

answers a broad range of recording problems

THIS amplifier (Model 150-300/700) is designed for use with low power galvanometer elements (output ±25 ma full scale into 100 ohm load), an oscilloscope and/or a panel meter, individually or simultaneously. Eleven plug-in type, interchangeable Preamplifiers are available for use with it, and include: AC-DC, Carrier, DC Coupling, Servo-Monitor, Log-Audio, Low Level, Input Network, AC Wattmeter, Frequency Deviation, Stabilized DC, and an RMS Volt/Ammeter.

Other available separate components include Recorder Assemblies from 1- to 8-channels, with chart speeds from 0.25 to 100 mm/sec.

A "component" application

FOUR Model 67-300 DC Amplifiers and a Model 154-100 four-channel Recorder Assembly are integrated with other equipment aboard a "flying geophysical laboratory" by PSC Applied Research, Ltd. of Toronto to record data from dual frequency detector magnetic survey equipment and a radiation detector, plus elevation variations during flight. The simultaneous recording of all four provides valuable reference data when interpretations are being made.

2-CHANNEL
1-CHANNEL

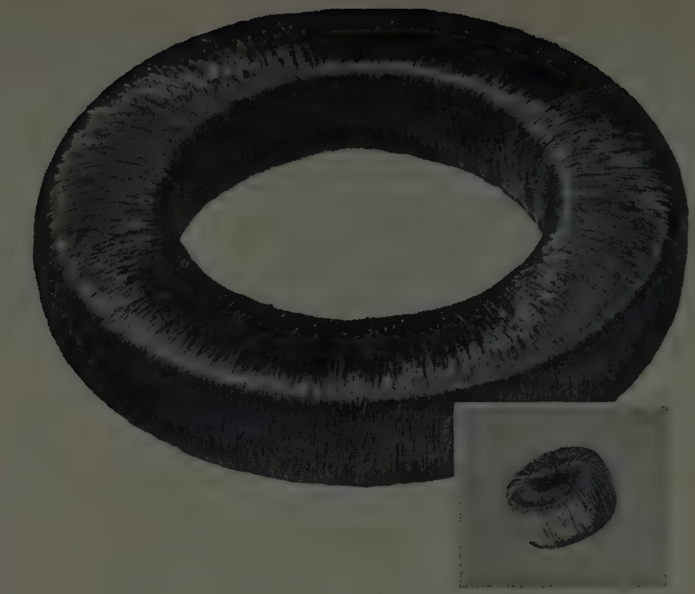
COMPLETE SYSTEMS

8-CHANNEL
4-CHANNEL
8-, 6-, 4-, 2-CHANNEL
ANALOG
COMPUTER
SYSTEMS

A Sanborn "150" system starts with a choice of an 8-, 6-, 4-, 2- or 1-channel basic assembly, to which the user adds any combination of plug-in type Preamplifiers to meet the numerous and changing recording requirements. Special 8-, 6-, 4-, and 2-channel systems are available for recording the output of analog computers, or other applications involving 1 volt/cm sensitivity. Added to this application versatility and operating flexibility of Sanborn systems are other advantages, such as inkless recording in true rectangular coordinates . . . high torque (200,000 dyne cm) galvanometer . . . time and code marking . . . numerous chart speeds.

Let Sanborn engineers help you solve *your* recording problems. Write for complete specifications and performance data on any Sanborn component or system.

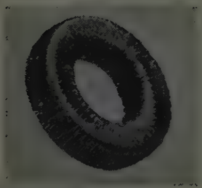
SANBORN COMPANY
INDUSTRIAL DIVISION
CAMBRIDGE 39, MASSACHUSETTS



How Big is a Toroid?

As large or as small
as your needs require . . .
if your source is B&W.
Barker & Williamson can
provide precision toroidal
coils wound on a production
line basis from doughnut
size to aspirin size.

A sure cure for production
and miniaturization
headaches.



B&W

Barker & Williamson, Inc.
237 Fairfield Ave., Upper Darby, Pa.

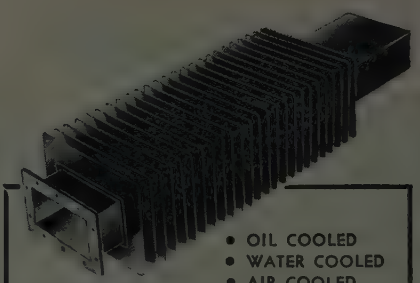
Industrial Engineering Notes

(Continued from page 40A)

one member and a deputy from the Offices of the Assistant Secretaries of Defense (R&D) and (AE). Associate members may be nominated by agencies of the Defense Department and other agencies of the government, with the appointment of such members subject to the approval of the Joint Coordinating Committee on Electronics. There will be no industry representatives of the group, but they will be called upon for assistance when needed and they will be selected from the Technical Advisory Panel on Electronics, which consists of some 50 or 60 industry representatives.

H. B. McCoy, Director of the Business and Defense Services Administration, Department of Commerce, recently wrote to all manufacturers of selenium rectifiers again urging that they make every effort to implement a program for the recovery of selenium from scrap rectifiers. This type of program has been encouraged in the past by the agency but in view of the current strike in western copper refineries, and the resultant curtailment of selenium production, the plea has been renewed. To help alleviate the shortage, set manufacturers were urged to put a program into effect whereby scrap rectifiers are returned

(Continued on page 44A)



- OIL COOLED
- WATER COOLED
- AIR COOLED

NEW!
High Power
DUMMY LOADS

Waveguide and Coaxial

Coaxial Loads:
up to 10 KW Average Power.

Waveguide Loads:
X-Band Loads up to 1000 Watts Average Power.
S-Band Loads up to 4000 Watts Average Power.
L-Band Loads up to 6000 Watts Average Power.

WRITE FOR NEW CATALOG

Electro Impulse Laboratory
208 River St. • Red Bank, N.J.
Red Bank 6-0404

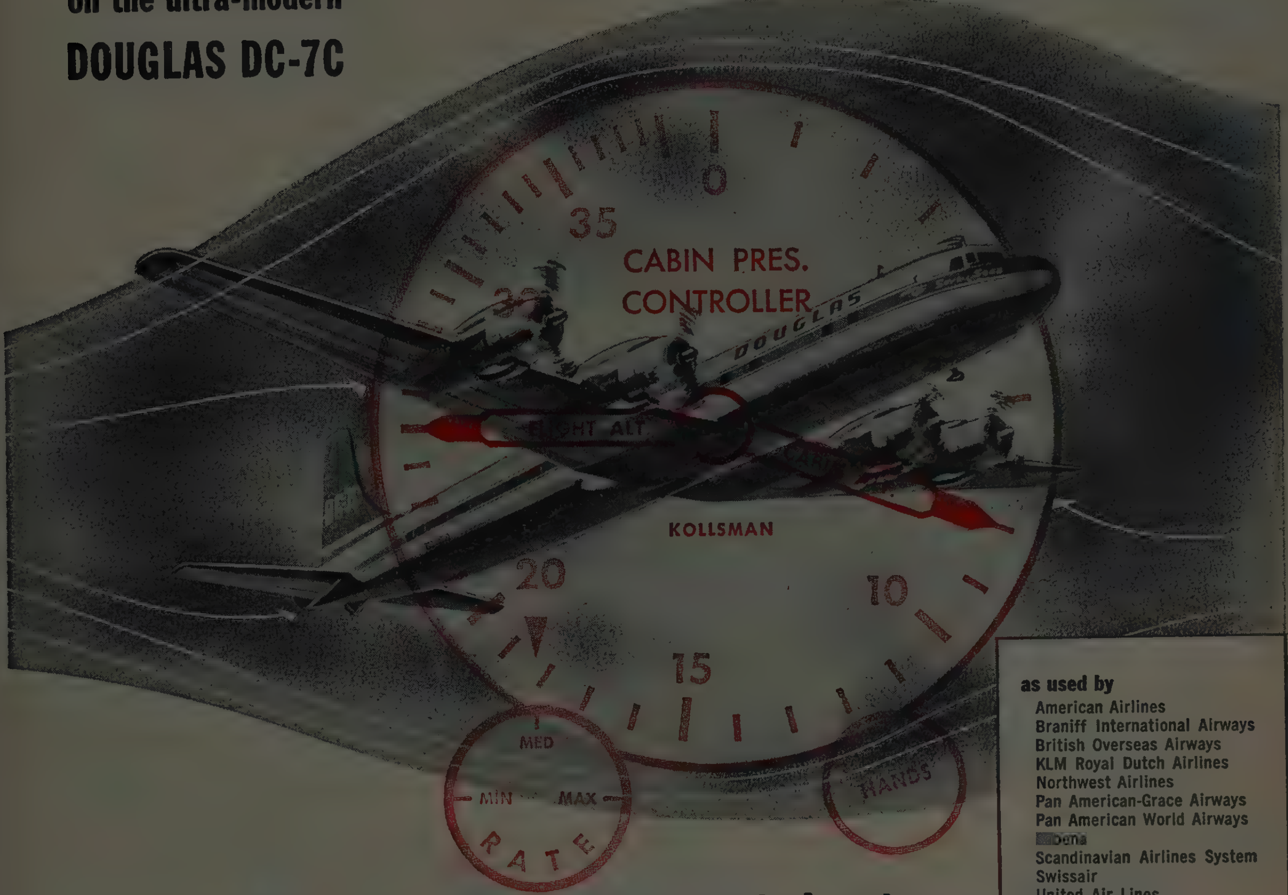
BENEFITS NEVER BEFORE POSSIBLE

- no annoying ear-popping
- simple controls — automatic, reliable
- far less maintenance
  No sensor contacts or filters to clean.
- completely electrical
  No complex tubing.
- lower cost
- lighter weight
  As much as 60% lighter!
- easily retrofitted in any existing aircraft
- particularly adaptable to future high performance air transports

STANDARD . . .

on the ultra-modern

DOUGLAS DC-7C



as used by

American Airlines
Braniff International Airways
British Overseas Airways
KLM Royal Dutch Airlines
Northwest Airlines
Pan American-Grace Airways
Pan American World Airways
Sabena
Scandinavian Airlines System
Swissair
United Air Lines
Western Air Lines

new KOLLSMAN KS-54 cabin pressure control system

DOUGLAS chose the new Kollsman KS-54 Cabin Pressure Control System for their new DC-7C's because of the many decided advantages it offers over the other existing systems.

LIVING-ROOM COMFORT IN THE CABIN . . . There is no annoying ear-popping because cabin pressure is held practically constant under cruising conditions. Even when cabin pressure is changing, the rate of change is so smoothly controlled that the actual change of pressure is unnoticable.

PEACE OF MIND IN THE COCKPIT . . . When the controls are set, the system is fully automatic and thoroughly reliable — especially so because of the simplicity of the Kollsman design.

NO WORRY IN THE MAINTENANCE SHOP . . . The components are simple and rugged, proven dependable and require a minimum of maintenance. There are no sensor contacts or filters to clean, no complex tubing to worry about.

WRITE for special folder giving full technical details on the new Kollsman KS-54 System, or ask to have a sales engineer visit you.

kollsman INSTRUMENT CORPORATION

80-16 45th AVE., ELMHURST, NEW YORK • GLENDALE, CALIFORNIA • SUBSIDIARY OF *Standard* COIL PRODUCTS CO. INC.

AMPHENOL
SUB*Minax*
SUBMINIATURE RF CONNECTORS
and
SUBMINIATURE CABLE

Weight-saving, space-saving SUBMINAX RF connectors! Obtain 500 rf circuits for each pound of weight using SUBMINAX, compared with 8 rf circuits for each pound of weight of equivalent Series N connectors! Space-saving: 7 SUBMINAX plugs occupy same space as 1 Series N plug!

Available in 50 and 75 ohm constant impedance—and in either push-on or screw-on coupling design. Complete line includes straight and right angle plugs, jack, cable feed through, bulkhead jack and receptacle. Hermetic seal receptacle in screw-on couplings only.

Cable assemblies with AMPHENOL subminiature coaxial cable easily accomplished with hand Crimping Tool—only two types needed for entire series.

AMPHENOL

AMERICAN PHENOLIC CORPORATION
chicago 50, illinois
In Canada: AMPHENOL CANADA LTD., *Toronto*

(Continued from page 42A)

promptly to the original supplier for reprocessing of the selenium. The cooperation of service technicians in this recovery program also will be helpful, it was pointed out. BDSA officials estimated that if an effective recovery program is carried out for scrap rectifiers about 20 per cent of the industry's yearly needs for selenium could be met. Since there never has been an over supply of selenium, a recovery program could be of value to the industry at all times, it was pointed out.

RETMA

RETMA has urged the Federal Communications Commission to relax its operating requirements for low-power television stations to "provide the true economic and operational incentive needed to make possible full utilization of the television broadcasting frequencies." The RETMA proposal was submitted at the request of the Special Satellite Television Committee under Chairman Ben Adler. RETMA told the FCC that its Report and Order authorizing low-power TV stations and relaxing construction requirements was insufficient. "The initial installation cost of a television station," RETMA said, "is incurred only once by a station operator, it is the daily operating cost of small stations which will undoubtedly prevent the early and widespread use of low-power television broadcasting. Therefore, further attention should be given by the Commission to those rules governing daily operation which will permit savings in daily operations." RETMA suggested that the use of remote control and directional antennas would permit savings in station operations. It may be appropriate to consider that the 100 watt minimum power rule should be waived in certain cases, RETMA added.

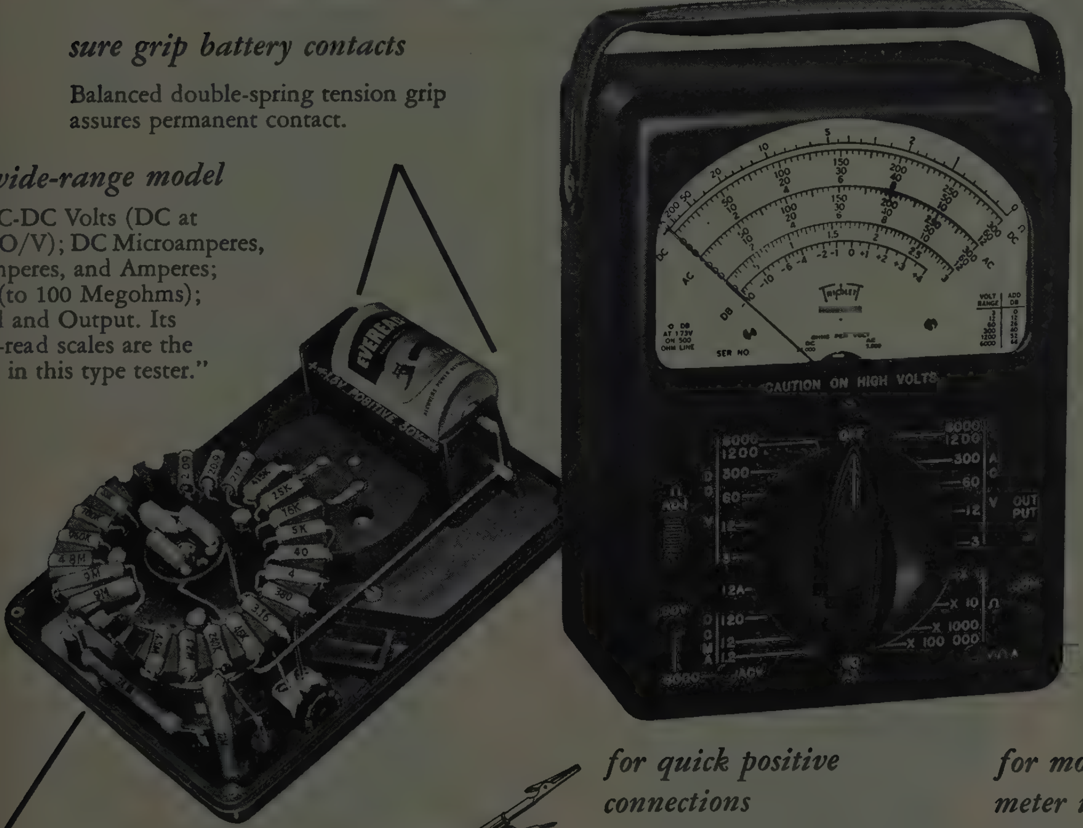
TECHNICAL

Basic research in surface chemistry at the Naval Research Laboratory has resulted in the development of a "miracle" lubricant with a wide variety of potential military and industrial uses, the Navy has announced. Known by its trade name, "Teflon," NRL chemists have shown that its easily applied plastic film coating can be used successfully as a dry lubricant and corrosion preventive in a score of electronic instruments. . . . **The Office of Technical Services, Commerce Department, announced studies in the field of electronics in its July issue of "U. S. Government Research Reports."** The following reports can be purchased from the Photoduplication Section, Library of Congress, Washington 25, D. C., for the price reported: "Artificial Quartz Crystals—Final Report," PB 117232; microfilm, $4.75; photocopy, $14. "Experimental Investigation of Noise Reduction in Traveling Wave Tubes,"

(Continued on page 46A)

u can't match TRIPLETT model 630 VOM

for **SPEED ACCURACY DURABILITY CONVENIENCE!**



heavy molded case

—¼" thick for high impact. Fully insulated.

sure grip battery contacts

Balanced double-spring tension grip assures permanent contact.

is wide-range model

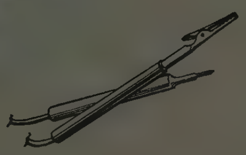
ts AC-DC Volts (DC at
,000 O/V); DC Microamperes,
illiamperes, and Amperes;
hms (to 100 Megohms);
ecibel and Output. Its
sy-to-read scales are the
ngest in this type tester."

streamlined design

No protruding knobs on switch or ohms control—both are flush with the panel.

king size recessed knob

—Only one switch; (fully enclosed) selects both circuit and range. Just turn the switch and make your reading.

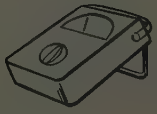


for quick positive connections

—Banana jacks and plugs on test leads are best. Alligator clips are provided to slip on test prods for extra convenience.

for most efficient meter use

—With every Model 630 you receive complete, simplified instructions on how to use and maintain most efficiently.



for convenience in reading

—Available as an extra (only 50c), this special stand tilts meter at best angle for easy reading

no slip feature

Four rubber feet furnished as standard equipment fit in back of the case to prevent slipping on smooth surfaces.

lvanced engineering

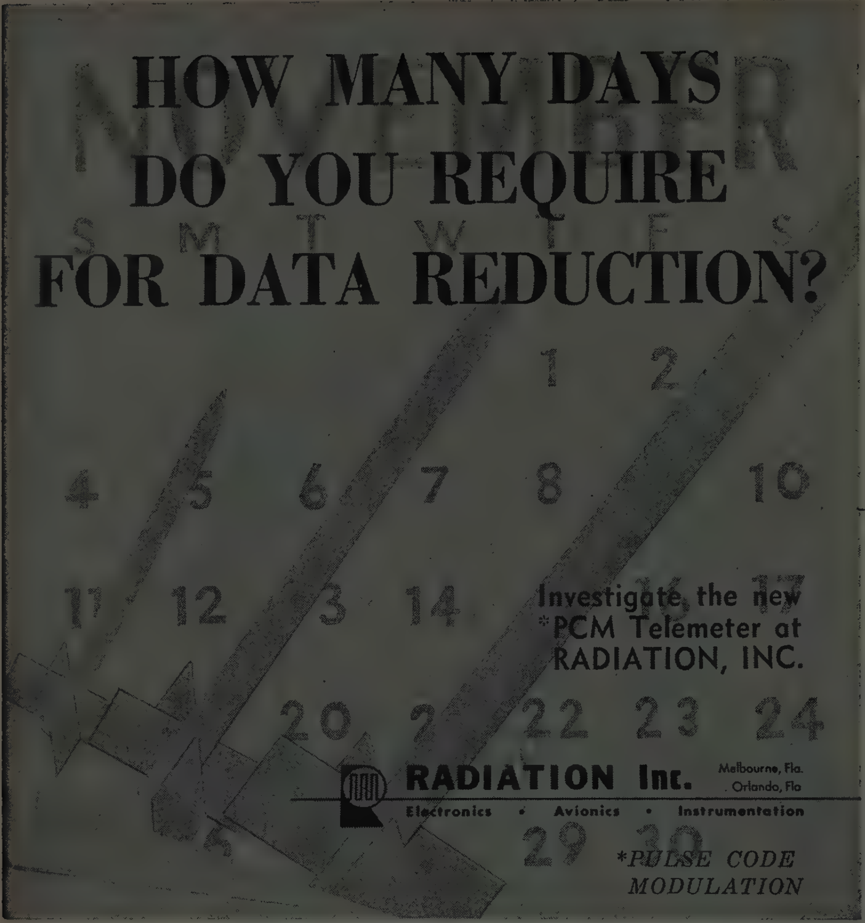
Molded mounting for resistors
l shunts allow direct connections
thout cabling. No chance for
orts. Longer life and easy-to-
place resistors in their marked
sitions.

MODEL 630 | $39⁵⁰

RIPLETT ELECTRICAL INSTRUMENT CO.
uffton, Ohio

THE MIGHTY NINE VOM LINE

631 mbination
630-NA For Best Testing
630 The Popular
630-A A Good Lab and
310 The Smallest
630-T For Telephone
666-HH Medium Size
625-NA The First V-O-M
666-R Medium Size



HOW MANY DAYS DO YOU REQUIRE FOR DATA REDUCTION?

Investigate the new *PCM Telemeter at RADIATION, INC.

RADIATION Inc.
Melbourne, Fla.
Orlando, Fla
Electronics • Avionics • Instrumentation

*PULSE CODE MODULATION

CO-AX 4 μμf/ft

★ ULTRA LOW capacitance & attenuation

WE ARE SPECIALLY ORGANIZED
TO HANDLE DIRECT ORDERS OR
ENQUIRIES FROM OVERSEAS
SPOT DELIVERIES FOR U.S.
BILLED IN DOLLARS—
SETTLEMENT BY YOUR CHECK
CABLE OR AIRMAIL TODAY

TYPE	μμF/ft	IMPED.Ω	O.D.
C 1	7.3	150	.36"
C 11	6.3	173	.36"
C 2	6.3	171	.44"
C 22	5.5	184	.44"
C 3	5.4	197	.64"
C 33	4.8	220	.64"
C 4	4.6	229	1.03"
C 44	4.1	252	1.03"

TRANS RADIO

NEW 'MX and SM' SUBMINIATURE CONNECTORS
Constant 50Ω - 63Ω - 70Ω impedances

TRANSRADIO LTD. 138A Cromwell Rd. London SW7 ENGLAND CABLES: TRANSRAD, LONDON

Industrial Engineering Notes

(Continued from page 44A)

PB 117114; microfilm, $2.25; photocopy, $4. "Effect of Transit Angle on Shot Noise in Vacuum Tubes," PB 117192; microfilm, $5.75; photocopy, $17.75. "Field Strength Measurements in Resonant Cavities," PB 117167; microfilm, $2.25; photocopy, $6.50. "Matric Algebra of Electromagnetic Waves," PB 117181; microfilm, $2.25; photocopy, $4. "Methods of Measuring the Properties of Ionized Gases at Microwave Frequencies," PB 117177; microfilm, $2.75; photocopy, $6.50. "Propagation of Electronic Space Charge Waves in Periodic Structures," PB 117113; microfilm, $2.25; photocopy, $4. "Shape of Collision-Broadened Spectral Lines," PB 117155; microfilm, $2.25; photocopy, $4. "TW-10, a High Writing, Speed Cathode-Ray Tube with Distributed Deflection," PB 117512; microfilm, $2.25; photocopy, $4. "Design of Linear Accelerators," PB 117185; microfilm, $3.75; photocopy, $10.25. "Use of Silicon Point-contact Rectifiers for Modulating Microwave Signals," PB 117189; microfilm, $2; photocopy, $2.75.

TELEVISION

According to the compilation from several sources, there are now 441 television stations in operation, 335 of which are VHF outlets and 106 UHF stations. Of this operating total, 15 are non-commercial TV stations, of which three are UHFs. The number of commercial construction permits granted by the FCC, but not yet on the air, total 152, of which 50 are VHF and 102 are UHF. The number of educational CPs granted, but not yet on the air, total 21, of which seven are VHF and 14 are UHF. . . . **A re-examination of the television allocation plan, in the light of experience gained since 1952, was urged recently by Federal Communications Commissioner Rosel H. Hyde.** "UHF is now suffering, and without attention it will wither and die, and buried with it may be our hopes for a nationwide competitive TV system," he told the Lions Club of Washington. If the 70 UHF channels are eliminated from use, he said, TV would become a "limited, protected and necessarily regulated service rather than the dynamic service contemplated by congressional policy." In considering possible allocation adjustment, Mr. Hyde suggested "judicious application of less rigid separation standards than those of the Sixth Report and Order, more emphasis on market areas and the use of such engineering techniques as directional antennas where such would contribute to the objective of the overall re-examination. The ultimate purpose, of course, would be to encourage the larger and more effective use of available TV channels. The ultimate full development of television in this country should not be hamstrung by having been limited to 12 channels in its pioneering stages." . . . A

(Continued on page 48A)

Is this versatile new CBS tube the answer to your HIGH-VOLTAGE CONTROL problems?

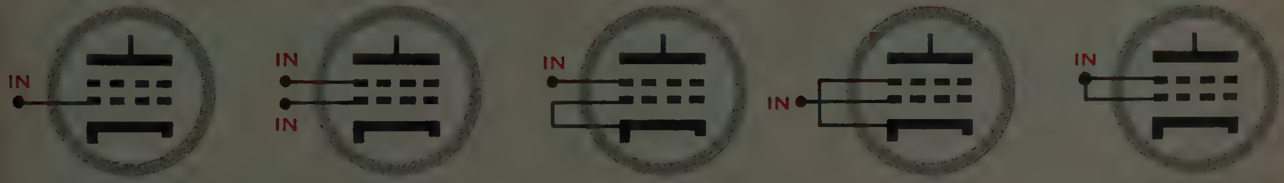
The 6792 is a CBS-Hytron advanced-engineering accomplishment that can solve high-voltage control problems in:

Nucleonics
Photronics
Radar
Industrial Electronics
Computers
Color TV
or Research.

Here is the first multipurpose, high-voltage control tube rated for operation from 3 to 25 kilovolts. An outgrowth of CBS-Hytron's long experience in designing transmitting and pulse tubes, this new tetrode will perform as a:

h-v regulator
h-v gating tube
h-v variable resistor
or h-v amplifier

Note the wide range of input connections to vary the operating characteristics



The versatile CBS 6792 may well be the answer to *your* high-voltage control problem. Check it. Write for data sheet E-258.

CBS TUBES

Quality products through *ADVANCED-ENGINEERING*

CBS-HYTRON, Danvers, Massachusetts . . . A DIVISION OF COLUMBIA BROADCASTING SYSTEM, INC.

PRECISION ATTENUATION TO 3000 mc!

Protected under Stoddart Patents

six-position

TURRET ATTENUATOR

featuring **PULL-TURN-PUSH** *action*

FREQUENCY RANGE: dc to 3000 mc.
CHARACTERISTIC IMPEDANCE: 50 ohms.
CONNECTORS: Type "N" Coaxial female fittings each end.
AVAILABLE ATTENUATION: Any value from 1 db to 60 db.
VSWR: 1.2 max., dc to 3000 mc/s, values from 10 to 60 db. As value decreases below 10 db, VSWR increases to not over 1.5.
ACCURACY: ± 0.5 db.
POWER RATING: One watt sine wave power dissipation.

SINGLE "IN-THE-LINE" ATTENUATOR PADS and 50 ohm COAXIAL TERMINATIONS

This new group of pads and terminations features the popular Type C and Type N connectors, and permits any conceivable combination of the two styles. For example, the two connector types, either male or female, can be mounted on the same attenuator pad, with or without flanges, so that it may serve as an adapter as well as an attenuator. Frequency range, impedance, attenuation, VSWR, accuracy and power rating are as designated above. Send for free bulletin entitled "Measurement of RF Attenuation."

STODDART AIRCRAFT RADIO Co., Inc.
6644-C Santa Monica Blvd., Hollywood 38, California • Hollywood 4-9294

Industrial Engineering Notes

(Continued from page 46A)

"Supplemental VHF Allocation Report" has been submitted to the Federal Communications Commission which "makes provision for the allocation of hundreds of additional VHF assignments" throughout the United States. The report was submitted by the Washington law firm of Welch, Mott and Morgan and Consulting Engineer John H. Mullaney and "is predicated upon the theory that a truly nationwide television service cannot be established by an intermixture of VHF and UHF stations as presently provided." It is proposed that by reducing minimum separations between presently assigned channels and using reduced power and directional antennas in some cases, the assignment of additional VHF channels could be made "without creating objectionable interference" under present FCC standards. It was noted that the Commission already has amended its rules to permit low-power TV station operation and it was urged that the submitted plan be adopted quickly "in the face of the present compelling situation demanding relief in the public interest." . . . **A complete summary of the Federal Communications Commission's third survey of post-freeze television**

(Continued on page 53A)

FOIL NAME PLATES

ADHESIVE-BACKED

park "thinplates"

are .003-inch aluminum foil ANODIZED, and backed by pressure sensitive adhesive. These plates conform to JAN specifications.

PARK NAMEPLATE CO., INC.
61-07 32 Ave.
Woodside 77, N.Y.

Industrial Engineering Notes

(Continued from page 48A)

stations, covering the period January 1 through October, 1954, is now available. The data presented in the FCC's Public Notice 23055 with accompanying tables, covers median monthly profit and loss, monthly revenues for affiliated and independent TV stations, and profit and loss data regarding UHF as well as VHF stations, in addition to other pertinent information. The document is available free of charge from the FCC, Washington 25, D. C.

Membership

The following transfers and admissions were approved and are now effective:

Transfer to Senior Member

Alberts, W. A., Pacific Palisades, Calif.
Bradford, W. O., Oxnard, Calif.
Brawner, C. A., Jr., Dallas 14, Tex.
Brown, H. A., State College, N. Mex.
Buescher, W. E., Emporium, Pa.
Clark, O., Madison, N. J.
Craig, G. F., Stratford, Conn.
Dasher, P. M., Huntington Station, L. I., N. Y.
Dorrell, R. E., Washington 20, D. C.
Eshleman, V. R., Redwood City, Calif.
Fast, S., Fair Haven, N. J.
First, D., Bayside 64, L. I., N. Y.
Friedman, O., New York 57, N. Y.
Gates, H. P., Jr., Los Angeles 45, Calif.
Gaunt, R. P., Van Nuys, Calif.
Goldsborough, R. R., Jr., Sunnyvale, Calif.
Hagaman, B. G., Alexandria, Va.
Hagman, H. B., Emporium, Pa.
Hammer, R. M., Brooklyn 8, N. Y.
Hilt, W. M., Dayton 9, Ohio
Hronek, R. L., Great Neck, L. I., N. Y.
Johler, J. R., Arvada, Colo.
Kansas, R. E., Elkins Park 17, Pa.
Killion, R. H., Dallas, Tex.
Kreek, J. A., Arlington, Va.
Krall, C. K., Glendale, Calif.
Maguire, J. P., Farmingdale, L. I., N. Y.
Mannino, A. J., Haddonfield, N. J.
Miegl, A. K., Evansville 11, Ind.
Mooers, H. T., Minneapolis 19, Minn.
Moore, E. B., Cedar Grove, N. J.
Nettesheim, H. P., Saratoga, Calif.
Parr, J. O., Jr., San Antonio 1, Tex.
Patterson, K. P., Falls Church, Va.
Patterson, T. T., Jr., Strafford, Pa.
Platt, H. J., Natick, Mass.
Rishell, G. L., Emporium, Pa.
Rubino, J. W., Fort Lee, N. J.
Schiller, H. H., Boston, Mass.
Sutherland, J. J., Oceanside, Calif.
Swierczak, P. C., Merchantville 8, N. J.
Tolbert, C. W., Austin 3, Tex.
Turnbull, H. A., College Park, Md.
Watson, R. H., San Diego 6, Calif.
Woodford, J. B., Jr., Pittsburgh 13, Pa.

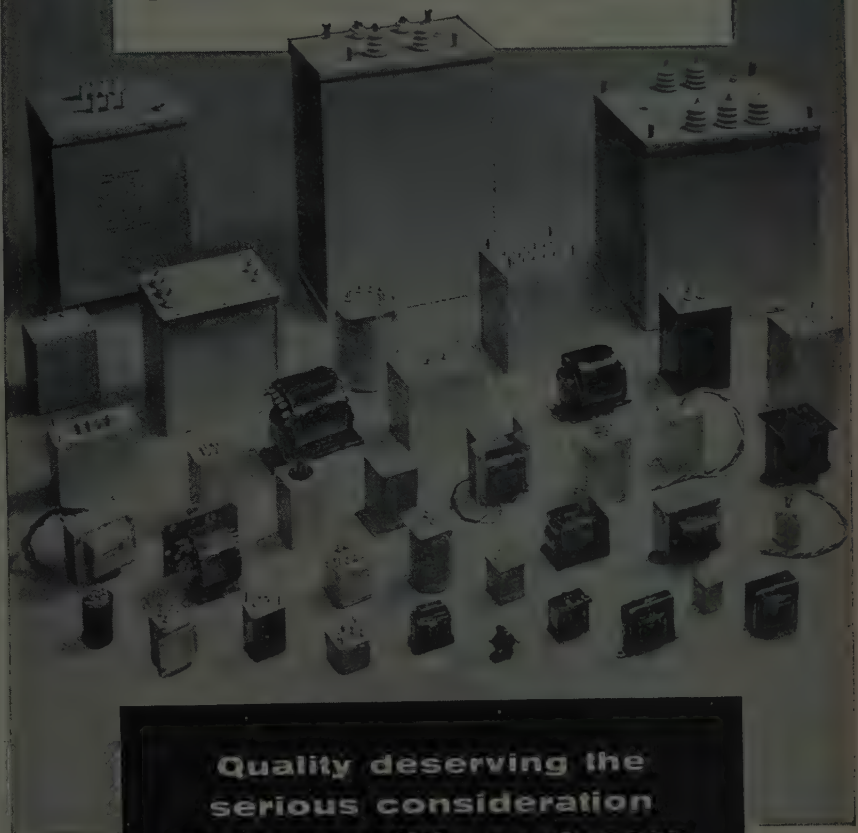
Admission to Senior Member

Andrews, D. H., Glen Cove, L. I., N. Y.
Ayoob, A. S., Karachi 2, Pakistan
Bandes, H., Woburn, Mass.

(Continued on page 54A)

Langevin
TRANSFORMERS

—to military specifications and for special performance requirements



Quality deserving the serious consideration of responsible engineers

- Separate sample and short run facilities to provide high speed service
- Approved for in-plant MIL-T-27 qualification testing
- Quotations supplied promptly on receipt of your requirements

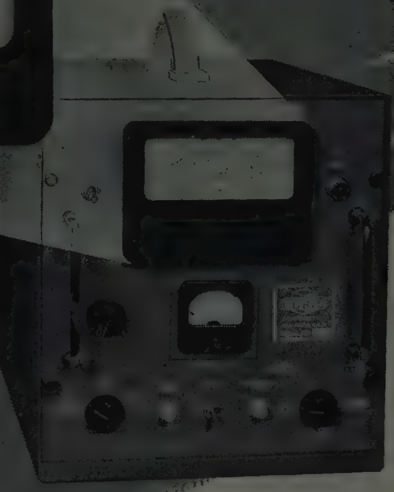
LANGEVIN MANUFACTURING CORPORATION
47-37 AUSTELL PLACE, LONG ISLAND CITY 1, N. Y.
Telephone: RAvenswood 9-1860
A Subsidiary of the W. L. Maxson Corporation

NEW!

CUBIC VSWR COMPUTER

PERCENT VOLTAGE REFLECTION COEFFICIENT
VSWR
USE SQUARE LAW RF DETECTORS
CAL

RAPID, ACCURATE MEASUREMENT OF VOLTAGE REFLECTION COEFFICIENT



MODEL 621B VSWR COMPUTER

FEATURES

- Automatic Computation
- Linear Read-out
- Amplitude Insensitive
- Phase Insensitive
- Linear Recorder Output

The Model 621B VSWR Computer—operated by non-technical personnel, provides highly accelerated, economical microwave transmission measurements with both CUBIC and other commercially available reflectometers and detectors. The instrumentation system is ideal for most development and all production test applications and by far the preferred method for recorded evaluation of microwave components.

The instrument develops both a calibrated meter display and a linear recorder output related to percentage voltage reflection coefficient, and features exceptional simplicity for the operator.

Four ranges of percent voltage reflection coefficient having full scale values of 5%, 10,% 50%, and 100%, and two VSWR scales, from 1.01 to 1.1 and 1.1 to 3.0, are provided to give excellent resolution and a sensible dynamic range. A calibration circuit provides an instantaneous check on the instrument. Self-contained matching transformers and a regulated bias source permit use of both barretters and crystal detectors.

The 621B VSWR Computer is insensitive to input power changes over a 20 to 1 range, assuring constant accuracy in both single and swept frequency unattended operation. The instrument is also insensitive to changes in the phase of both modulation and the microwave carrier, eliminating a large potential source of error. Write for complete details on this important new instrumentation system and send us your requirements for specialized microwave impedance metering instruments.

CUBIC CORPORATION
ELECTRONIC EQUIPMENT . . . RESEARCH . . . DEVELOPMENT
2841 Canon Street San Diego 6, California

Membership

(Continued from page 53A)

Blake, G. A., Washington, D. C.
Davis, M. M., Jr., Rockville, Md.
Gaines. W. M., Scotia 2, N. Y.
Gallaher, J. F., Cambridge 38, Mass.
Goggio, E. C., Baltimore 28, Md.
Griffith, M. E., Fairborn, Ohio
Hall, H., Washington 25, D. C.
Hamilton, R. E., Northridge, Calif.
Hendriks, H. J., San Luis Obispo, Calif.
Hirmann, J., Hillside 5, N. J.
Hobbs, E. W., Ferguson 21, Mo.
Hoyt, C. W., Merchantville 8, N. J.
Klotter, K., Stanford, Calif.
Nail, J. J., Chicago 41, Ill.
Oberlander, F. M., Camden 2, N. J.
Presentey, S. M., Montreal 9, Que., Canada
Rines, R. H., Belmont 78, Mass.
Sailor, R. W., Jr., Levittown, Pa.
Stone, H. A., Jr., Murray Hill, N. J.
Senti, E. C., Cedar Rapids, Iowa
Turner, E. H., Red Bank, N. J.

Transfer to Member

Accardo, N. A., Bloomfield, N. J.
Aiken, R., Los Altos, Calif.
Algor, M. M., Washington 25, D. C.
Anderson, L. W., Montreal, Que., Canada
Anderson, R. W., Kansas City 4, Mo.
Anger, H. O., Berkeley, Calif.
Anglin, D., Dayton, Ohio
Antin, J., Jamaica 35, L. I., N. Y.
Apgar, R. R., Jr., Charleston, W. Va.

(Continued on page 56A)

Designers
Manufacturers
Of
PLASTIC LIGHTING PANELS and DIALS

◆

Specialists
In The
INTEGRAL LIGHTING OF INSTRUMENTS

◆

Authorized
LIGHT TESTING
Facility of Bu-Air

◆

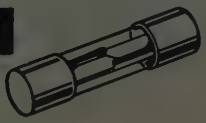
BODNAR INDUSTRIES
238 Huguenot St.
New Rochelle, N.Y.

. . . You'll find the Type and Size Fuse you need

• • • IN THE COMPLETE LINE OF BUSS AND FUSETRON FUSES

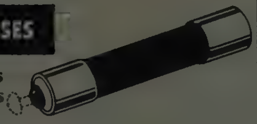
The following is only a partial listing. The complete BUSS line of fuses includes dual-element (slow blowing), renewable and one time types — in sizes from 1/500 ampere up . . . plus a companion line of fuse clips, blocks and holders.

BUSS AGX FAST ACTING FUSES



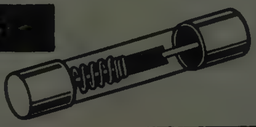
$\frac{1}{4}$ x 1 in. Glass tube 1/500 to 2 amp.

BUSS IBM SIGNAL ACTIVATING FUSES



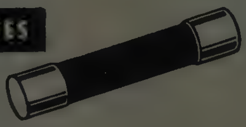
$\frac{1}{4}$ x $1\frac{1}{4}$ inch. Silverplated pin pops out when fuse is blown and activates signal or alarm.

FUSETRON MDL FUSES



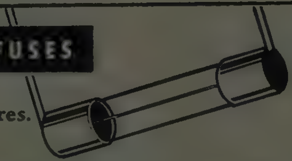
$\frac{1}{4}$ x $1\frac{1}{4}$ inch. *Dual-element — slow blowing type 1/100 to 30 amp.*

BUSS ABC CERAMIC TUBE FUSES



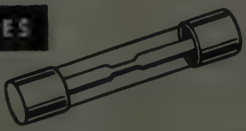
$\frac{1}{4}$ x $1\frac{1}{4}$ inch. High interrupting capacity fuses $\frac{1}{4}$ to 30 amp.

BUSS GJV PIG TAIL FUSES



$\frac{1}{8}$ to 6 amp. Solder into circuit wires.

BUSS SFE STANDARD FUSES

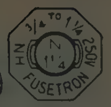


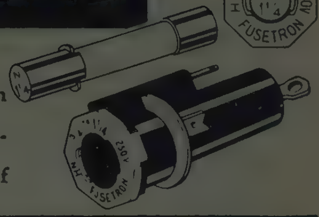
Fuses of different amperages are different lengths — to make it impossible to insert too large a size.

FUSETRON FNM FIBRE TUBE FUSES

$\frac{13}{32}$ x $1\frac{1}{2}$ inch. *Dual-element — slow blowing type.*

FUSETRON TYPE N and TYPE C FUSES and FUSEHOLDERS





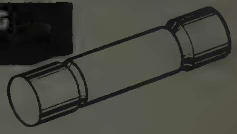
Especially suitable for protection of TV

Ears on fuses match slots in holder.

Marking on fuse and fuseholder in direct view.

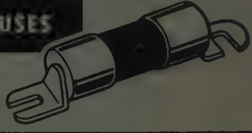
Safeguard against use of wrong size and type of fuse.

BUSS KLM HIGH INTERRUPTING CAPACITY FUSES



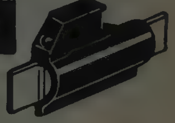
$\frac{13}{32}$ x $1\frac{1}{2}$ inch. Capable of safely interrupting 68,000 amps.

FUSETRON ACK CLAMP TYPE FUSES



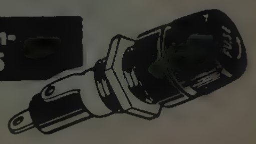
20 to 300 amp., *Dual-element type.*

BUSS ACO AIRCRAFT FUSES



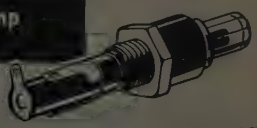
Mechanical Indicating — Limiter type 1 to 75 amp.

BUSS Series HJ and HK Non-Indicating FUSEHOLDERS



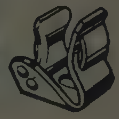
Panel mounted for $\frac{1}{4}$ x 1 inch and $\frac{1}{4}$ x $1\frac{1}{4}$ in. fuses.

BUSS Series HJ and HK Lamp Indicating FUSEHOLDERS



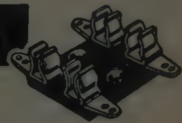
Panel mounted for $\frac{1}{4}$ x 1 inch and $\frac{1}{4}$ x $1\frac{1}{4}$ inch fuses.

BUSS No. 4051 ONE-PIECE CLIP and TERMINAL



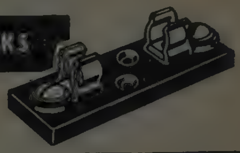
Solder type terminal for $\frac{1}{4}$ inch fuses.

BUSS No. 4409 FUSE BLOCKS



Small Base, solder type Side Terminals.

BUSS No. 4512 FUSE BLOCKS



Full Base, Screw type Terminals.

For more detailed information to help you select fuses and fuseholders to meet your electrical protection needs . . . Write for bulletin SFB.

Or tell us your problem and let our Fuse Engineers assist you in getting the protection you require.

BUSSMANN MFG. CO.
Div. McGraw Elec. Co.
University at Jefferson
St. Louis 7, Mo.

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

Makers of a complete line of fuses for home, farm, commercial, electronic and industrial use.

IRE 1155

MARCONI

mark of superior performance . . . on the new

UNIVERSAL BRIDGE Model 868/1

Model 868/1

Marconi's new Universal Bridge is designed for peak performance and ease of operation. Dual Oscillator Frequencies of 1kc and 10kc provide sharper balance at low values of inductance and capacity.

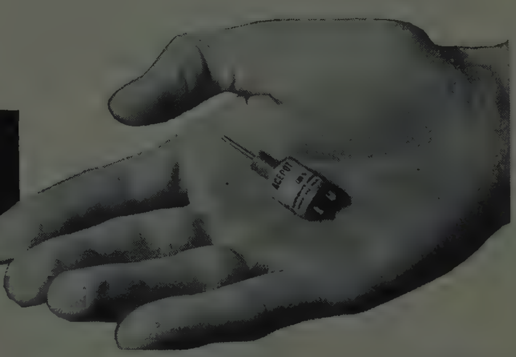
- 21 Ranges: 1 μH to 100H, 1 μμF to 100 μF 0.1 Ω to 10M Ω
- Built-in Oscillator and VTVM Detector
- Direct Reading: no calculations
- Tubes: 6SN7, 6J5, 6J7, 6Q7
- Price: $365.00 F.O.B. N.Y.C. Immediate Delivery.

Make no mistake, specify Marconi . . . for bridges up to 100Mc, Deviation Meters, Audio & RF Power Meters, VTVM's. Write for specifications to:

MARCONI Instruments
44 New Street, New York 4, N. Y. • HAnover 2-0197-8
MARCONI—Since 1897

sub-miniature

ACEPOT



the *smallest* wire wound precision potentiometer

½" Size—Linearity .3%—High Resolution—200 Ω to 100K*

torque: .035 oz./in. @ 20° C.
power rating: 2 watts for 60° C. rise
meets applicable portions of MIL-E-5272A standards

ambient temperature: —55° C. to 125° C.
*Resistance Range: 200 Ω to 100K standard, ± 2%. Higher or lower on special order.

Standard, servo or flush mountings . . . dual or up to 6-gang units.

The case and threaded mounting bushing is one-piece anodized aluminum for maximum heat dissipation. The shaft is centerless ground stainless steel. Standard bearing in aluminum or bronze insert. Available for lower torque requirements with ball or jewel bearings. All units fully sealed, moistureproofed, fungicide treated.

Our unique manufacturing and testing facilities *assure you of controlled quality.* Each ACEPOT is performance tested and a Polaroid picture record is supplied showing linearity and resolution.

Send for specification sheet, application data sheet and prices. Your inquiry will receive prompt attention.

ACETRIM

½" size
linearity 3%
10 Ω to 50 K ± 5%

ACETRIM . . . a low-priced, sub-miniature trimmer potentiometer with the same fine characteristics as the *ACEPOT*. Meets MIL standards. Available standard or shaft lock. Stops if required.

ACE ELECTRONICS ASSOCIATES
129 Rogers Avenue, Somerville 44, Mass.
ACEPOT, ACETRIM trademarks applied for.

Membership

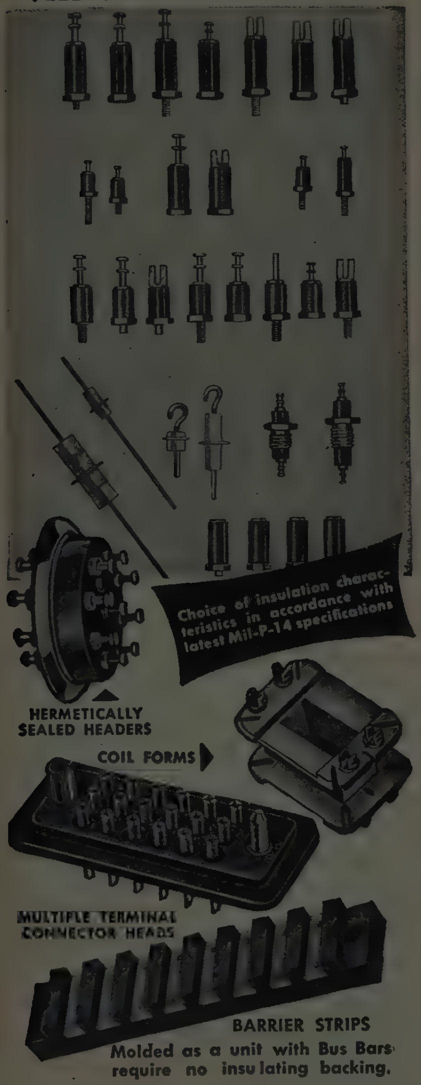
(Continued from page 54A)

Ashton, D., E. Rochester, N. H.
Ataman, A., Istanbul, Turkey
Atwell, R. G., Washington 7, D. C.
Atwood, K. W., Sandy, Utah
Bailey, L. E., Valley Falls, R. I.
Baltz, L. E., Albuquerque, N. Mex.
Barker, E. E., Olive Hill, Ky.
Barnes, R. S., Lake Success, L. I., N. Y.
Bartlett, G. W., Durham, N. C.
Battle, R. P., Bayside, L. I., N. Y.
Beauchesne, L. A., Ottawa 2, Ont., Canada
Bellmar, C. L., Hempstead, L. I., N. Y.
Bennett, J. H. van S., Mt. Pleasant, S. C.
Benson, R. K., Dover, N. J.
Benzon, C. G., Annandale, Va.
Bernstein, J. L., Bayside 64, L. I., N. Y.
Bethard, C. T., W. Covina, Calif.
Beverly, N. E., Poughkeepsie, N. Y.
Bishop, B. E., Arlington, Calif.
Bitter, C. R., Jr., Phoenix, Ariz.
Blacker, H. L., Belleville, Ont., Canada
Bolinder, E. F., Stockholm, Sweden
Brodsky, J. L., Fair Lawn, N. J.
Broxmeyer, C., Philadelphia 24, Pa.
Brubaker, P. M., Glen Ridge, N. J.
Buri, F. J., Chicago 40, Ill.
Busby, J. W., Levittown, Pa.
Callahan, B. E., Skokie, Ill.
Chaney, L. W., Ann Arbor, Mich.
Chang, D. C., Honolulu, T. H.
Clarke, W. R., Los Angeles 5, Calif.
Coombs, S. H., Pittsburgh 36, Pa.
Corey, V. B., Berkeley 5, Calif.
Cox, G. C., Dartmouth, N.S., Canada
Cox, J. L., North Bergen, N. J.
Crenca, J. J., Washington 20, D. C.
Culicetto, P. J., Staten Island 10, N. Y.
Dacken, L. L., Grosse Pointe Woods 36, Mich.
Dasher, P. M., Huntington Station, L. I., N. Y.
Daverio, A. J., Van Nuys, Calif.
Davis, R. J., Syracuse 3, N. Y.
Deal, D. L., Baltimore, Md.
De Lano, R. B., Jr., Poughkeepsie, N. Y.
De Mott, J., Burlington, Iowa
Diemer, F. P., Pasadena 1, Calif.
Dong, H. L. H., Jamaica 32, L. I., N. Y.
Doshay, I., Culver City, Calif.
Ducoff, G., China Lake, Calif.
Edelsohn, C. R., Los Angeles 24, Calif.
Eland, P. D., Dumont, N. J.
Elbinger, B., Whittier, Calif.
Eliot, A. B., Fayetteville, N. Y.
Ellsworth, R. L., Berkeley, Calif.
Evans, W. H., Ames, Iowa
Field, B., Syracuse, N. Y.
Fine, H., Washington 23, D. C.
Ford, J. R., West Covina, Calif.
Gariano, W. F., Newton Square, Pa.
Gleichauf, T. J., Phoenix, Ariz.
Goeller, L. F., Jr., Orange, N. J.
Goldfein, S. F., Neponsit, L. I., N. Y.
Goodell, C. E., W. Hyattsville, Md.
Gotschall, G. D., Cleveland 3, Ohio
Gruen, H. E., Chicago 28, Ill.
Guaragna, L. F., Mexico City, Mex.
Guiral, R. L., Vedado, Cuba
Guthrie, R. C., Washington 21, D. C.
Guyton, C. W., Napa, Calif.
Haag, M. W., Redwood City, Calif.
Haas, D. B., Manhattan Beach, Calif.
Hack, N. R., Inglewood, Calif.
Hall, R. C., Jackson Heights 72, L. I., N. Y.
Hamilton, D., London N. 14, England
Harper, F. N., Tulsa 20, Okla.
Harris, H. D., Troy, N. Y.
Harris, L. R., Hamilton, Ont., Canada
Harris, R. C., Los Angeles 29, Calif.
Harvey, H. F., Eggertsville, N. Y.

(Continued on page 59A)

FOR HIGH FREQUENCY
HIGH VOLTAGE
SPACE SAVING APPLICATIONS

GARDE
Miniature & Sub-Miniature
INSULATED STAND-OFFS,
FEED THROUGHS & SPACERS


Choice of insulation characteristics in accordance with latest Mil-P-14 specifications
HERMETICALLY SEALED HEADERS
COIL FORMS
MULTIPLE TERMINAL CONNECTOR HEADS
BARRIER STRIPS
Molded as a unit with Bus Bars require no insulating backing.

For users to properly assess the outstanding features and advantages of Garde Components, samples will be sent on request. A detailed technical catalog is now available. Be sure your name is on our mailing list.

We have complete facilities to accommodate your special requirements, ranging from Engineering Consulting Service to Precision Design and Production.

GARDE
MANUFACTURING COMPANY
MOLDERS OF THERMOPLASTIC AND THERMOSETTING MATERIALS
588 Eddy Street, Providence 3, Rhode Island,
Sales Representatives in Principal Cities

Membership

(Continued from page 56A)

Heacock, W. J., Jr., Levittown, L. I., N. Y.
Hein, D. W., Detroit 5, Mich.
Hellmann, R. K., Westbury, L. I., N. Y.
Hergenhan, O. J., Newark, N. J.
Hershberger, W. O., Jr., Arlington 6, Va.
Herz, H., New York 55, N. Y.
Hirschel, L. R., Silver Spring, Md.
Horan, J. J., New York, N. Y.
Houck, G. B., Jr., Port Chester, N. Y.
Hubbard, B. R., Princeton, N. J.
Huie, J. A., Penfield, N. Y.
Huntsman, H. F., N. Hollywood, Calif.
Iverson, F. A., Chicago 13, Ill.
James, C. L., Rochester, N. Y.
Jensen, J., Baltimore 6, Md.
Johnson, P. C., Bedford, Mass.
Johnson, R. M., Fort Meade, Md.
Johnson, V. L., Bloomfield, N. J.
Kawai, W. T., San Francisco, Calif.
Kazan, B., Princeton, N. J.
Kelley, R. A., Murray Hill, N. J.
Kinross, R. I., Wandsworth, London S. W., England
Knapp, J. Z., Jamaica 35, L. I., N. Y.
Knausenberger, G. E., State College, Pa.
Kniazuk, M., Mountainside, N. J.
Knoblauch, A., Jr., St. Paul 4, Minn.
Knowles, D. M., Rockledge, Fla.
Koehler, A. O., New York 33, N. Y.
Kongable, L. S., Prospect Heights, Ill.
Kovalevski, N. N., Palo Alto, Calif.
Krenicki, J., Terryville, Conn.
Krim, N. B., Newton Center, Mass.
Krueger, W. F., Chicago 39, Ill.
Kunc, F., New York 10, N. Y.
Lambert, J. M., Torrance, Calif.
Lanier, R. E., Grand Prairie, Tex.
Landry, N. R., New Orleans 21, La.
Larson, R. E., Boulder, Colo.
Lauer, H., Camden, N. J.
Lavrench, W., Ottawa 2, Ont., Canada
Lazarus, A., Culver City, Calif.
Lea, H. D., Danville, Va.
Lee, V. C., Franklin Square, L. I., N. Y.
Le Grand, H. R., Orlando, Fla.
Leighton, H. W., Montclair, N. J.
Lenwell, L. W., McCook, Nebr.
Leonhardi, J. O., Chicago, Ill.
Lerch, Q. A., Jr., Williston Park, L. I., N. Y.
Levinson, S., Uniondale, L. I., N. Y.
Limansky, I., Babylon, L. I., N. Y.
Lincoln, J. P., San Antonio 1, Tex.
Lock, R. W., Pomona, Calif.
Lockwood, G. C., Dayton 3, Ohio
Lothringer, R. C., Monrovia, Calif.
Loewenstein, C. N., Long Beach 2, Calif.
Loiacono, J. V., Detroit 21, Mich.
Lord, A. S., Dayton 10, Ohio
Loucks, P. G., Washington 4, D. C.
Lubkin, Y. J., Chambersburg, Pa.
Ludvigson, M. T., Cedar Rapids, Iowa
Lun, M. J., Silver Spring, Md.
Lyons, W. J., Jr., Hamden 14, Conn.
Maartmann-Moe, R., Lexington 73, Mass.
MacFadden, W. C., Philadelphia 11, Pa.
Magin, J. J., Lynbrook, L. I., N. Y.
Makinson, G. E., Enon, Ohio
Malan, D. G., Pretoria, South Africa
Margulies, F., Franklin Square, L. I., N. Y.
Martin, P. W., Whittier, Calif.
Mausler, R., New York 9, N. Y.
Maxwell, K. D., Longview, Tex.
McArthur, H. K., Houston, Tex.
McBrian, J. E., Port Washington, L. I., N. Y.
McCasland, R. S., Alamogordo, N. Mex.
McCollister, D. R., Cleveland 6, Ohio
McCoy, R. D., Bronxville, N. Y.
McKinnis, C. E., Owensboro, Ky.
Merrigan, C. F., Syracuse, N. Y.

(Continued on page 60A)

Just Published

FUNDAMENTALS OF ELECTROACOUSTICS

By F. A. FISCHER, *Fernmeldetechnisches Zentralamt, Darmstadt, Germany*. Translated by STANLEY EHRLICH, *Raytheon Manufacturing Company, Waltham, Mass.*, and FRITZ PORDES, *U. S. Navy Underwater Sound Laboratory, New London, Conn.*

Written for those who are engaged in the solution of electroacoustical problems in a thorough and exhaustive manner. Presents the necessary fundamental theory in closed form.

CONTENTS—

1. Electric and Mechanical Oscillators.
2. Forces Exerted on Matter by Electric and Magnetic Fields.
3. Electroacoustic Energy Conversion Principles and Their Basic Laws.
4. Systematic Presentation of Electroacoustic Transducers.
5. The Differential Equations of Electroacoustic Transducers.
6. Electric and Acoustic Impedance of Transducers.
7. The Radiation of Sound.
8. The Efficiency of a Transducer as a Sound Source.
9. The Sensitivity of a Transducer as a Sound Receiver.
10. Broad-band Transducers.
11. Electromechanical Coupling.
12. Transducers Employing Electric Resistances.

List of Symbols, Terms, and Units.
Bibliography.
Index.

198 pages 102 illus.
5 tables $6.00

INTERSCIENCE
PUBLISHERS, INC.
250 Fifth Avenue, New York 1, N.Y.

BALLANTINE Model 300

STILL THE FINEST IN ELECTRONIC VOLTMETERS

Featuring a Logarithmic Voltage Scale and Uniform Decibel Scale

PRICE $210.

VOLTAGE RANGE	.001v to 100v
FREQUENCY RANGE	10 cps to 150 kc
ACCURACY	2% ENTIRE RANGE
INPUT IMPEDANCE	½ meg shunted by 30 uuf

- Stability insured by the exclusive use of wire-wound resistors in the attenuator and feedback network.
- Same accuracy of reading at *ALL* points on the logarithmic voltage scale and linear decibel scale.
- Only ONE voltage scale to read with decade range switching.
- No "turn-over" discrepancy on unsymmetrical waves.
- Accessories available to extend the range to 20 µv and to 42,500 volts.
- Available Precision Shunt Resistors convert voltmeter to microammeter covering range from 1 microampere to 10 amperes.
- Provides 70 DB amplifier flat within 1 DB from 10 cps to 150 kc.

For further information on this and other Ballantine instruments write for our new catalog.

BALLANTINE LABORATORIES, INC.

102 Fanny Road, Boonton, New Jersey

Membership

(*Continued from page 59A*)

Merrill, H. B., Jr., Packanack Lake, N. J.
Miller, D. H., Hastings-on-Hudson, N. Y.
Miller, E. A., Cuba, N. Y.
Miller, H. L., Boulder, Colo.
Miller, R. E., Arlington, Va.
Minkus, F., Chicago 45, Ill.
Moehring, W. D., Kalamazoo, Mich.
Montanari, R. E., Brighton 35, Mass.
Moody, C. S., Seattle, Wash.
Moore, J. M., Manhattan Beach, Calif.
Morrison, A. C., San Francisco. Calif.
Mudgett, A. H., Tombstone, Ariz.
Murdock, B. J., Adelphi, Md.
Myers, A. S., Jr., Lexington, N. C.
Nadler, M., Tr. Prvniho Pluku, CSR, Czechoslovakia
Nafzger, L. H., Columbus 9, Ohio
Nash, H. C., Cleveland 21, Ohio
Nisteruk, C. J., New York 3, N. Y.
Norman, T. J., Jr., Fort Worth, Tex.
Noviks, B., Buenos Aires, Argentina
O'Neal, C. D., Glenside, Pa.
O'Neil, J. A., San Francisco 22, Calif.
Oppenheimer, F. W., New York 28, N. Y.
Overmiller, C. M., Paoli, Pa.
Pamphilon, L. E., Hyattsville, Md.
Parker, D. L., Toronto, Ont., Canada
Parkhill, D. F., Ottawa, Ont., Canada
Parmelee, W. G., Walla Walla, Wash.
Peebles, N. A., Wilmington, N. C.
Pels, E., New Rochelle, N. Y.
Pidhayny, D. D., Los Angeles 16, Calif.
Piety, R. G., Bartlesville, Okla.
Pitts, W. J., Gidea Park, Essex, England
Plaisance. S. F., Newton 58, Mass.
Pope, G. S., Glendale 2, Calif.
Price, J. F., Silver Spring, Md.
Price, O. L., Frederick, Md.
Prior, R. R., Arlington, Tex.
Pritchard, W. S., Fort Lauderdale, Fla.
Purcell, W. J., Schenectady, N. Y.
Randall, A. E., Waukesha, Wis.
Ravenscrift, H. A., Petaluma, Calif.
Read, C. T., Chicago, Ill.
Reitlinger, A., Woodhaven, L. I., N. Y.
Rendell, G., Stamford, Conn.
Roush, F. H., Detroit, Mich.
Rubin, R., Natick, Mass.
Salerno, A., Winston-Salem, N. C.
Schantz, G. W., Dayton 5, Ohio
Schneider, H. A., Murray Hill, N. J.
Schultz, C. J., Elmhurst, Ill.
Sheingold, D. H., Tooele, Utah
Shelton, G. L., Jr., Utica 3, N. Y.
Sherman, F. L., Sao Paulo, Brazil
Sherman, W. K., Washington 1, D. C.
Sillitoe, S., Belleville, Ont., Canada
Smith, H. B., Perkasi, Pa.
Smith, H. J., Needham 92, Mass.
Smith, S. L., New Hartford, N. Y.
Smith, W. F., Jr., Denver, Colo.
Snow, V. M., Los Angeles 65, Calif.
Snyder, E. H., Seward, Nebr.
Soorenko, T., Philadelphia 41, Pa.
Spies, M. C., Arlington, Va.
Sprung, J., New York 1, N. Y.
Stanonis, A. F., Des Plaines, Ill.
Staubitz, E. J., Pittsburgh, Pa.
Stewart, J. L., Bethesda, Md.
Sturgeon, S. S., Foxboro, Mass.
Sward, W. O., South Gate, Calif.
Sweet, R. A., Patuxent River, Md.
Swenson, A. N., Jr., Glendale 2, Calif.
Swift, W. B., Madison, Wis.
Tarantur, S., River Grove, Ill.
Tarrants, G., Dayton 3, Ohio
Taylor, L. A., Schenectady 9, N. Y.
Thompson, H. K., Inverness, Calif.
Thompson, R. B., Los Angeles 65, Calif.

(*Continued on page 62A*)

Hoffman
LABORATORIES, INC.

A SUBSIDIARY
OF HOFFMAN
ELECTRONICS
CORPORATION

research*

development

design

production

INTEGRATED ELECTRONICS

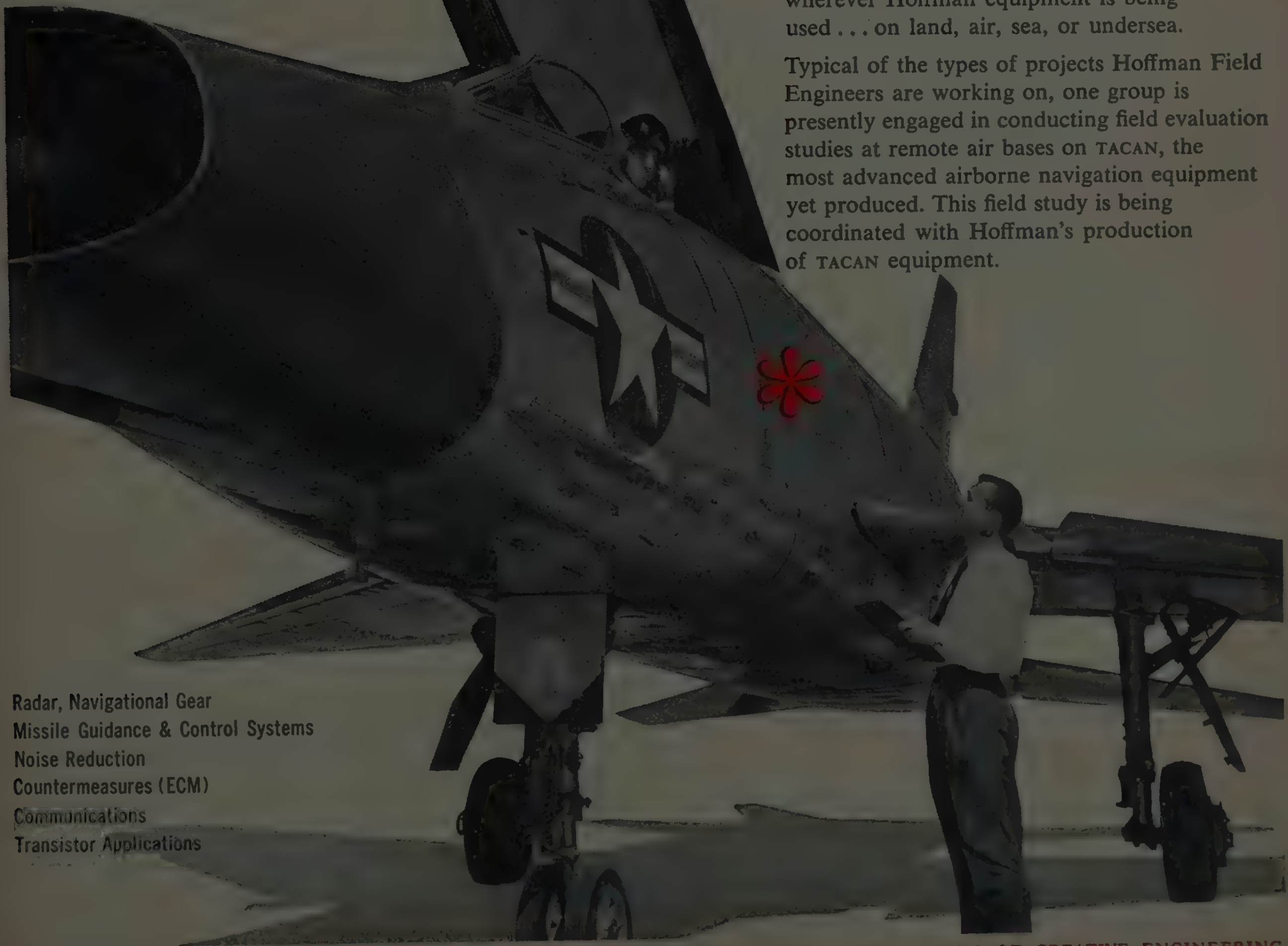
THE IMAGINATION FOR RESEARCH PLUS
THE SKILLS FOR PRODUCTION

Performance in the field is the real test of product worth. To maintain Hoffman's reputation for high standards of quality and performance, Field Engineers are constantly performing direct, on-the-spot aid in installation, operation, and evaluation of Hoffman electronic equipment.

Hoffman Field Engineers are chosen from the engineering design and test groups for their specialized knowledge and ability. These specially trained, specialized engineers carry the integrated skills of research, development, design, and production into the field . . . wherever Hoffman equipment is being used . . . on land, air, sea, or undersea.

Typical of the types of projects Hoffman Field Engineers are working on, one group is presently engaged in conducting field evaluation studies at remote air bases on TACAN, the most advanced airborne navigation equipment yet produced. This field study is being coordinated with Hoffman's production of TACAN equipment.

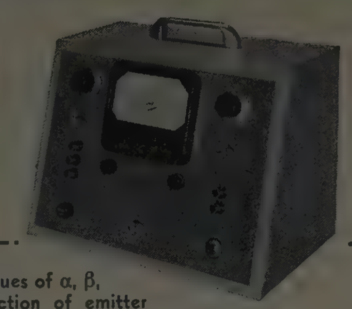
NUMBER 4 OF A SERIES



Radar, Navigational Gear
Missile Guidance & Control Systems
Noise Reduction
Countermeasures (ECM)
Communications
Transistor Applications

CHALLENGING OPPORTUNITIES FOR OUTSTANDING ENGINEERS TO WORK IN AN ATMOSPHERE OF CREATIVE ENGINEERING. WRITE THE DIRECTOR OF ENGINEERING, HOFFMAN LABORATORIES, INC., 3761 SOUTH HILL STREET, LOS ANGELES 7, CALIFORNIA.

TRANSISTOR ALPHA TESTER



Gives direct reading of the dynamic values of α, β, for all types of transistors, as a function of emitter and collector bias. Also, tests for α cut-off and value of α at high frequencies. Accuracy is independent of temperature, line voltage and other variables while flexibility of performance prevents obsolescence by new transistor types. Ideal for both production testing and laboratory measurement.

FEATURES

- Direct reading of A, β, parameters
- Tests for α cut-off at high frequency
- Simple to operate, direct reading
- Independent of line voltage, and other variables
- For quality control, production testing
- For transistor circuit design and laboratory application

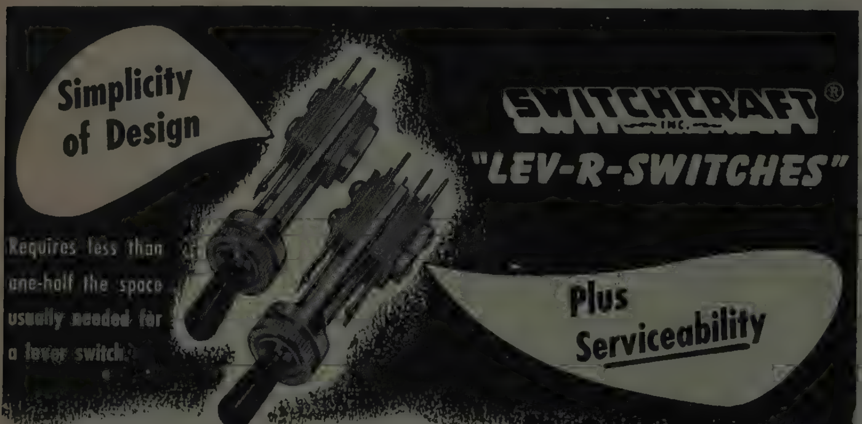
SPECIFICATIONS

ALPHA RANGE .... 0-0.99 (β, 0-100)
ACCURACY .... 5%, full scale
ALPHA FREQUENCY .... Internal, 240 cps. External Osc. 5 mc max.
ALPHA CUT-OFF RANGE .... 5 mc max. (External Osc.)
DC BIAS .... NPN or PNP; Ie, 0-10 ma; Ec. 0-100 volts
INDICATING METER .... 4½" meter reads Alpha, DC bias
SIZE .... Hardwood Cabinet, 8" x 11" sloping panel

Write to Dept. P-3 for bulletins and technical data on our complete line of transistor test equipment.

ELECTRONIC RESEARCH ASSOCIATES, INC. ERA

67 East Centre Street Nutley, New Jersey


Simplicity of Design
SWITCHCRAFT® INC.
"LEV-R-SWITCHES"
Requires less than one-half the space usually needed for a lever switch.
Plus Serviceability

Made in two and three position types; momentary and locking actions. Single hole mounting. Attractive hardware. Long springs without any "forms" at point of flexing insure long spring life. Springs insulated from each other by phenolic spacers with hard rubber tubing press fit through the stack—insures correct alignment of the contacts and provides high insulation resistance. "Soft" easy action actuator; real detent action on locking types.

Fine silver contacts, rated at 3 amperes, 120 volts, A.C. non-inductive load—standard. Also available on special order with larger silver contacts for higher currents and Palladium contacts for low current—low voltage circuits.

TELEVER SWITCH

For more rugged applications. Features unusual "T-Beam" frame construction—light design with ruggedness of a structural "T-Beam."

Full details in Catalog S-52—fourth printing—send for your copy.

SWITCHCRAFT INC. 1332 N. Halsted St. Chicago 22, Ill.

Canadian Representative: Atlas Radio Corp. Ltd., 50 Wingold Avenue, Toronto, Canada.

AVAILABLE AT ALL LEADING RADIO PARTS JOBBERS

Membership

(Continued from page 60A)

Throckmorton, K. L., South Sudbury, Mass.
Tillotson, J. H., Palo Alto, Calif.
Traino, C., Rochester 9, N. Y.
Troetschell, W. O., Dayton 3, Ohio
Turkish, M. C., Detroit 13, Mich.
Uhrig, R. B., Kansas City 8, Mo.
Ujifusa, R. L., San Francisco, Calif.
Ulrich, J. F., Brecksville, Ohio
Uyeda, M. M., Chicago 15, Ill.
Vale, S. D., Chicago, Ill.
Van Niekerk, T., Pretoria, South Africa
Volberg, H. W., San Diego 7, Calif.
Von Kummer, F. G., Darien, Conn.
Von Ohlsen, L. H., Jr., Allentown, Pa.
Von Utfall, J. C. J., Stockholm, Sweden
Wallin, G., Chicago 45, Ill.
Walsh, J. R., Jr., Atlanta, Ga.
Weil, R. B., La Paz, Bolivia
Whitman, J. A., Concord, Mass.
Wilkins, F. W., Buffalo 22, N. Y.
Wilson, R. A., Reseda, Calif.
Winter, C. W., Jr., Little Ferry, N. J.
Wood, L. R., New Toronto, Ont., Canada
Wood, L. E., Oxnard, Calif.
Yaskoff, R., Detroit 28, Mich.
Young, R. G., Racine, Wis.
Zambo, J. W., Fort Morgan, Colo.
Zion, H., Flushing, L. I., N. Y.

Admission to Member

Adise, H. H., Great Neck, L. I., N. Y.
Alexander, H. C., Peabody, Mass.
Allen, U. L., Washington 5, D. C.
Anderson, R. J., Key West, Fla.
Anderson, W. L., Houston 4, Tex.
Andrews, M. B., Rome, N. Y.
Bachtell, R. S., Cuyahoga Falls, Ohio
Becker, J. T., W. Los Angeles, Calif.
Belmont, E., Asbury Park, N. J.
Bender, A., Great Neck, L. I., N. Y.
Bonner, J. T., Teaneck, N. J.
Bornarth, D. M., Chicago 21, Ill.
Bradley, R. E., Paoli, Pa.
Brewer, L. R., Prairie Grove, Ark.
Carter, E. C., Buffalo 8, N. Y.
Cateora, J. V., Denver 3, Colo.
Chang, B., Park Forest, Ill.
Coe, R. B., Fort Walton Beach, Fla
Currie, J. D., Los Angeles 4, Calif.
Danner, F. G., Forest Hills 75, L. I., N. Y.
Dawson, E. C., Sacramento, Calif.
Dillingham, J. H., Lebanon, Ill.
Fischer, J. N., Fort Worth, Tex.
Garee, J. A., Jr., Crystal Bay, Minn.
Geist, W. K., Glendale 39, Calif.
Greenfield, W. D., Dayton 3, Ohio
Gregory, T. R., Toronto 9, Ont., Canada
Harrison, J. F., Dayton 5, Ohio
Hartley, J. H., Oaklyn 6, N. J.
Hiatt, W. R., Utica, N. Y.
Iwaoka, I. S., Chicago 14, Ill.
Jiles, C. W., Fort Worth 16, Tex.
Josephson, B. A. S., Stockholm 80, Sweden
Junker, E. S., Levittown, Pa.
Kapust, L. A., Woodbury, N. J.
Karns, L. W., Baltimore 1, Md.
Kirschenbaum, J., New York, N. Y.
Koda, N. J., Culver City, Calif.
Kruse, J. R., Jr., Hartsdale, N. Y.
Lehner, L. L., Neptune, N. J.
Long, C. M., Albuquerque, N. Mex.
Lublin, I., Syosset, L. I., N. Y.
Maitra, K. K., New York 27, N. Y.
Margala, A. J., Chicago 28, Ill.
Meeds, D. S., Philadelphia 4, Pa.
Murphy, T. P., Mountain View, Calif.
Myroyannis, A. J., Athens 8, Greece

(Continued on page 64A)

SOMETHING NEW FROM VARIAN...

HIGH STABILITY

WITHOUT ELECTRONIC COMPONENTS

VA-1281
Stalo Cavity
with VA-201 klystron

VA-1282
Stalo Cavity
with X-26 klystron

VA-1280
Stalo Cavity
with VA-201 klystron

Now—with Varian's new line of high Q Cavities, frequency stabilized local oscillators (Stalos) utilizing direct cavity stabilization are commercially practical. Varian Stalo Cavities provide a very high degree of short time frequency stability. Stabilization is completely independent of the frequency of oscillator fluctuations and external disturbances . . . an inherent advantage over electronic stabilization systems utilizing the feedback principle. Elimination of all electronic components except the klystron oscillator also affords greater reliability and longer life.

The ratio of the oscillator modulation sensitivity to the modulation sensitivity of the stabilized oscillator defines the stabilization factor of the cavity. Varian Stalo Cavities are available in three models—VA-1280, 1281 and 1282—offer stabilization factors from 15 to 160 . . . cover a wide range of important applications, including stabilization of signal sources in high power klystron transmitters . . . airborne uses in conjunction with receiver local oscillators . . . laboratory testing. When used with Varian's new highly stable reflex klystron oscillators, stability comparable to that of many crystal controlled oscillators can be obtained.

COMPLETE TECHNICAL DATA and specifications are now available.

Your inquiry is cordially invited.

THE
MARK OF
LEADERSHIP

VARIAN associates
PALO ALTO 2, CALIFORNIA
Representatives in all principal cities.

KLYSTRONS, TRAVELING WAVE TUBES, BACKWARD WAVE OSCILLATORS, R. F. SPECTROMETERS, MAGNETS, STALOS, UHF WATERLOADS, MICROWAVE SYSTEM COMPONENTS, GRAPHIC RECORDERS, RESEARCH AND DEVELOPMENT SERVICES

SERVO
MOTOR-GENERATORS
FOR EVERY
PURPOSE

Kearfott Servo Motor-Generators are characterized by low rotor inertia, low time constants and high stall torque. Motor-Generator combinations provide ½ to 3.1 volts per 1000 R.P.M. with an extremely linear output over a speed range of 0—3600 R.P.M. and useful output up to 10,000 R.P.M.

CHARACTERISTICS

TYPE	MOTOR		GENERATOR	
	STALL TORQUE	NO LOAD SPEED	OUTPUT FUND. NULL	LINEARITY
DAMPING				
SIZE 10	.35 OZ. IN.	6000	21/1	.5%
SIZE 10	.30 OZ. IN.	8500	23/1	.5%
SIZE 11	.63 OZ. IN.	5900	25/1	.5%
SIZE 15	1.5 OZ. IN.	5000	25/1	.5%
SIZE 18	2.4 OZ. IN.	5000	25/1	.5%
SIZE 18	3.0 OZ. IN.	9600	23/1	.5%
RATE				
SIZE 15	.45 OZ. IN.	10,500	170/1	.5%
SIZE 15	1.5 OZ. IN.	4700	350/1	.2%
SIZE 18	2.4 OZ. IN.	4700	350/1	.2%
SIZE 18	3.0 OZ. IN.	8400	350/1	.2%
*INTEGRATOR				
SIZE 15	.70 OZ. IN.	6300	400/1	.1%
SIZE 15	1.25 OZ. IN.	4500	400/1	.1%
SIZE 18	1.35 OZ. IN.	7200	400/1	.1%
SIZE 18	2.4 OZ. IN.	5200	333/1	.05%
SIZE 18	3.0 OZ. IN.	8000	333/1	.05%

*Integrator Tachometers are temperature stabilized

Send for Bulletin describing Servo Motor-Generators of interest to you.

ENGINEERS

Many opportunities in the field of Precision components are open. Write for details today.

Kearfott

A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

KEARFOTT COMPANY, INC., LITTLE FALLS, N. J.

Sales and Engineering Offices: 1378 Main Avenue, Clifton, N. J.
Midwest Office: 188 W. Randolph Street, Chicago, Ill. South Central Office: 6115 Denton Drive, Dallas, Texas
West Coast Office: 253 N. Vinedo Avenue, Pasadena, Calif.

Membership

(Continued from page 62A)

Nagaraja, N. S., Bangalore 3, India
Nomura, T., Tokyo, Japan
Piele, G. H., Albuquerque, N. Mex.
Pippin, R. F., Jr., Pendleton, S. C.
Pugh, M. D., Altadena, Calif.
Seals, R. B., Irving, Tex.
Sebasky, G. M., Poughkeepsie, N. Y.
Shaw, H. J., Palo Alto, Calif.
Smith, J. M., Syracuse, N. Y.
Staudaher, F. M., New Hartford, N. Y.
Stein, H. S., Lynn, Mass.
Suzuki, K., Tokyo, Japan
Weiland, W. A., Cedar Rapids, Iowa
Weston, B. J., Albuquerque, N. Mex.
Willis, P. A., New Hyde Park, L. I., N. Y.
Yueh, J. H., Los Angeles 8, Calif.
Yutkowitz, C. K., Massapequa Park, L. I., N. Y.

The following elections to the Associate grade were approved and are now effective:

Barber, A. E., Poughkeepsie, N. Y.
Bennett, R. G., River Forest, Ill.
Berry, B. H., Redwood City, Calif.
Bertram, J. E., New York 11, N. Y.
Bever, K. H., New York 7, N. Y.
Blalock, J. N., Spring Valley, Calif.
Bloemker, L. J., Philadelphia 29, Pa.
Boivin, P. B., Jr., Central Falls, R. I.
Borden, C. C., Philadelphia 40, Pa.

(Continued on page 66A)

HHB

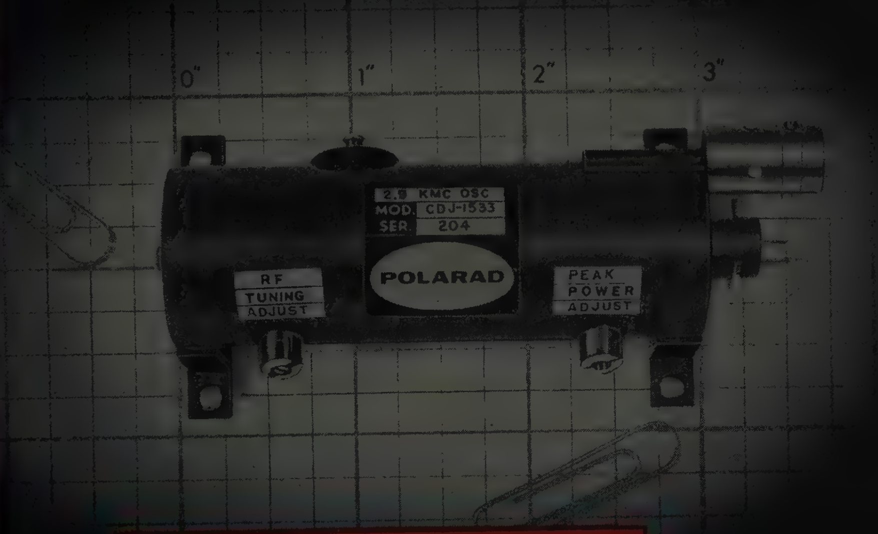
research
design
engineering
manufacturing

of outstanding quality
CONNECTORS • CABLE ASSEMBLIES
including
PRINTED CIRCUIT
AN Types • RF
RACK and PANEL
(Standard and Special)
for America's Electronic Industry
Catalog—Literature Available

H. H. BUGGIE, Inc.
BOX 817 • TOLEDO 1, OHIO

SUB-MINIATURE S-BAND CAVITIES

2750-3000 mc



Sub-miniature is the word. The new Polarad S-Band cavities are only 3" long and 1" in diameter, yet outperform many larger cavities. They are particularly suited for beacon transmitters, missiles, radar, etc., where miniaturization is a key factor in the choice of components. These cavities withstand vibration, 500 g shock test, 100 g longitudinal acceleration, and are temperature compensated over the range of 0°C to 70°C. They are available for grid-pulsed, plate-pulsed, or CW operation. They may be code modulated by conventional drive circuits using hard tube or gaseous tube types.

All S-Band cavities are factory tuned to the desired frequencies, and can be varied by means of a simple special tool which permits simultaneous frequency and locking adjustment.

FEATURES:

- Extremely small size, 1" x 3"
- Ruggedized pencil triode
- 300 V DC supply is required for grid pulsing
- Temperature compensated
- Meets all MIL specifications
- Fixed low impedance output coupling into 50 OHM BNC connector

CONSULT US ON YOUR APPLICATIONS

FIELD MAINTENANCE SERVICE THROUGHOUT THE COUNTRY

SPECIFICATIONS:

MODEL	Modulation	Power Output	PRF
CGP-1	Grid Pulsed	2 watts peak	0-4,000 PPS
CPP-1	Plate Pulsed	100 watts peak	0-1500 PPS
CCW-1	CW	50 MW	— —

Tuning Range	2750 – 3000 mc
Pulse Width	0.75 ± 0.1 μSec.
Rise Time	0.1 μSec.
Frequency Stability	0.02 mc/°C

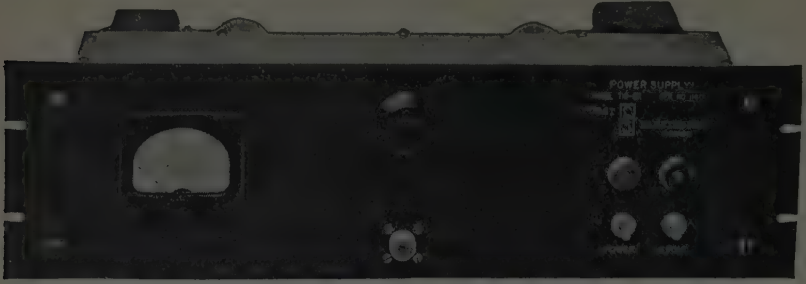
POLARAD
PROVEN RELIABILITY

ELECTRONICS CORPORATION
43-20 34th STREET • LONG ISLAND CITY 1, N. Y.

REPRESENTATIVES • Albuquerque • Atlanta • Baltimore • Boston • Chicago • Cleveland • Fort Worth • Kansas City • Los Angeles • New York
Philadelphia • San Francisco • Seattle • St. Paul • Syracuse • Washington, D. C. • Canada, Arnprior • Export: Rocke International Corporation

1500 VOLT Regulated POWER SUPPLY

For Photo-Multiplier Tubes



Front View of Model 710-PR Power Supply

Continuously Adjustable from 400 to 1500 V.D.C. at 0-1 Milliamperes

POSITIVE TERMINAL GROUNDED

Regulation: Output voltage varies less than .01% per volt change of line voltage. Output voltage varies less than 1 volt with variations of output current between 0-1 milliampere. (Internal impedance less than 1000 ohms.)

Model 710P
Cabinet Mounted
$210.00*

MODEL 710PR
Standard Rack
Mounting
$215.00*

Also available with 2 or 3 independently regulated and independently adjustable outputs.

Write for Descriptive Bulletin

Models Available With Negative Terminal Grounded (Substitute letter "N" for "P" in model designation).

**Prices net F.O.B. Chicago*

FURST
ELECTRONICS, INC.
3326 W. Lawrence Ave., Chicago 25, Illinois

for $1175

NON-LINEAR SYSTEMS new digital voltmeter--Model 451.

Special design for industrial applications.

Uses oil-immersed stepping switches, life-tested for 20,000,000 readings.

Measures from ±0.001 to ±999.9 volts d-c.

Automatic decimal point location and polarity indication in luminous display.

Rapid and accurate measurement by non-technical personnel.

write for bulletin 241

NON-LINEAR SYSTEMS, INC.
Del Mar Airport
Del Mar, California

Membership

(Continued from page 64A)

Brown, L. R., Royal Oak, Mich.
Calvino, O., San Martin, Buenos Aires, Argentina
Campbell, J. S., Arlington, Va.
Cancio, P., Mountain View, Calif.
Cannon, H. L., Los Angeles 64, Calif.
Carson, G. B., Teterboro, N. J.
Colton, R. M., New York 25, N. Y.
Cooney, J. J., Mishawaka, Ind.
Croft, W. F., Glendale 8, Calif.
den Dunnen, H., Toronto 10, Ont., Canada
Diehn, R. J., Toledo 12, Ohio
Dietz, W. F., Toronto 4, Ont., Canada
Dolid, W. A., Culver City, Calif.
Duncombe, W. M., Butler, N. J.
Easson, G. S., Baltimore 12, Md.
Endsley, J. P., Sunnyvale, Calif.
Evers, T. J., Toronto 4, Ont., Canada
Feiner, H. A., Long Beach, L. I., N. Y.
Friedman, J. A., San Fernando, Calif.
Fritz, C. F., St. Mary's, Pa.
Gibson, J. M. D., Ottawa 4, Ont., Canada
Gildart, J. F., Jr., Palatine, Ill.
Gleason, J. V., Minot, N. Dak.
Goodman, P. H., Los Angeles 43, Calif.
Guinane, J. E., Allston 34, Mass.
Haller, F. B., Boulder, Colo.
Hamilton, R. F., Los Angeles 37, Calif.
Hayden, R. J., Long Beach 6, Calif.
Hearson, L. T., Kansas City 13, Mo.
Holdsworth, R. M., Jr., Lansdowne, Pa.
Hollis, R. D., Cordova Bay, B. C., Canada
Howard, R. E., Denver 10, Colo.
Hunt, V. R., Baltimore 14, Md.
Johns, J. G., Sidney, B. C., Canada
Johnson, R. J., Skokie, Ill.
Kay, J. R., Kansas City 8, Mo.
King, B., Prince Frederick, Md.
Kleinberg, H., Bayside, L. I., N. Y.
Kolodin, L., Trenton, N. J.
Kotik, J., New York, N. Y.
Lambidakis, P. G., Endicott, N. Y.
Leatherman, J. E., Chicago 13, Ill.
Levine, B. I., Long Beach, L. I., N. Y.
Levine, S., Silver Spring, Md.
Longley, A. G., Boulder, Colo.
Lowe, A. D., Toronto 4, Ont., Canada
McCaul, J. N., Teterboro, N. J.
Marshall, D. E., Beaver Dams, N. Y.
Martinazzoli, A., Milano, Italia
Mauro, A., Brooklyn, N. Y.
May, E. S., Washington 21, D. C.
Metelmann, C., Owensboro, Ky.
Miller, H. D., El Paso, Tex.
Morgenstern, H. S., Imola, Calif.
Morrione, C., Jr., Billerica, Mass.
Mortenson, H. R., Toronto 4, Ont., Canada
Mousel, G. W., El Segundo, Calif.
Neuman, G. O., Sherman Oaks, Calif.
Pattat, H. M., Syracuse 1, N. Y.
Patton, P. C., Wichita 4, Kans.
Paxton, E. B., Schenectady 5, N. Y.
Poncetta, J. E., Buenos Aires, Argentina
Poole, N. K., Fort Bliss, Tex.
Puidak, H., Chicago 40, Ill.

(Continued on page 68A)

Use your
IRE DIRECTORY
It's valuable

Performance is TOPS!

When you buy communications receivers, you buy performance above all else. And, performance is what you get when you buy the *NEW* PRO-310. It's the receiver designed with performance in mind. And, the PRO-310 outperforms all other receivers in its class. Here's why —

- ✓ **Took 3 years engineering and design time to develop, including 1½ years to iron out the 'bugs'.**
- ✓ **Hammarlund has the receiver know-how gained by making thousands of sets for gov't. service.**
- ✓ **These features:**
  - Frequency readings to 1 part in 5000
  - Continuously calibrated bandspread *over the entire range*
  - Exceptional stability
  - High Image Rejection—*on all 6 bands*
  - Sectionalized construction
  - Etched and plated circuits in the RF section
  - Many others

Check on the *NEW* PRO-310—it's made to order for your "tough-spot" service. Write for specs and other details to The Hammarlund Manufacturing Co., Inc., 460 West 34th Street, New York 1, N. Y. Ask for Bulletin I-11.

The "Heart" of the Pro-310

Newly developed front-end with three tuned circuits but only one RF tube amplifier provides remarkable selectivity and ultra-high signal-to-noise-ratio.

HAMMARLUND
Since 1910

New
PRO-310
CALIB
RECEIVE
CARRIER LEVEL

Shallcross

for precision resistors

SINCE 1929

AKRA-OHM Precision Wirewounds

High-quality, yet moderately-priced precision resistors suitable for the majority of applications. Reverse-pi wound on accurately-machined ceramic bobbins. Coated, if desired, with moisture-resistant varnish. Std. tolerance—1%, 0.5%, 0.25%, 0.1%, and 0.05%. Meets MIL-R-93A. Five mounting styles available.

Bulletin L-35

"P" TYPE Encapsulated Wirewounds

Small, hermetically-sealed resistors at a truly low price. Unmatched stability for critical applications. Std. tolerance—same as Akra-Ohm types above. Meet and exceed MIL-R-93A requirements including salt water immersion tests. Radial leads, axial leads, or lug type terminals.

Bulletin L-30

DEPOSITED CARBON Precision Resistors

These small carbon-film resistors achieve exceptional stability through deposition of a uniform, uncontaminated film of carbon on a ceramic core. Temperature coefficient: 500 ppm per °C above 1 meg., 300 ppm per °C below 1 meg. Std. tolerance—1%, 2%, and 5%. Meet characteristic R of MIL-R-10509A. ½, 1, and 2 watt sizes.

Bulletin L-33

CASTOHM® Ceramic Power Resistors

Unusually light-weight wirewound power resistors with a unique integral core and coating having exceptional resistance to thermal shock and excellent heat conductivity. Ten humidity-resistant, tab-terminal styles available with ratings from 8 to 225 watts at 350°C. hot-spot. Meet MIL-R-10566, Amendment 1.

Bulletin L-29

CMP and **MP** Miniature Power Wirewounds

Lead-mounting, miniature power wirewounds for crowded chassis or printed circuits. MP types enclosed in a Fiberglas sleeve and coated with silicone-impregnated ceramic. CMP types encased in ceramic tube with ends hermetically sealed with silicone cement. Designed to MIL-R-26B. 3 to 10 watt sizes available.

Bulletin L-36

SPECIALS . . . .

Hermetically-sealed Steatite resistors, Ayrton-Perry resistors, high-voltage surge resistors, card-type resistors, multi-section bobbin resistors, and many other special types are regularly produced to individual specifications.

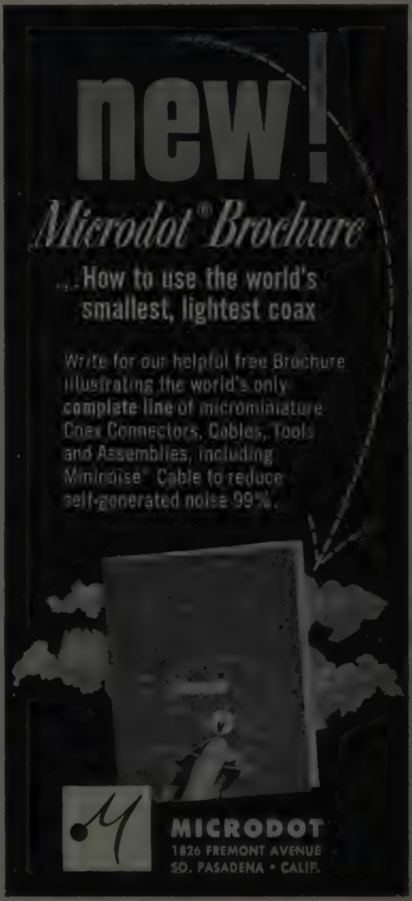
Bulletin L-37

SHALLCROSS MANUFACTURING CO., 524 Pusey Ave., Collingdale, Pa.

Membership

(Continued from page 66A)

Reed, R. C., Whittier, Calif.
Reynolds, F. L., Harbor View, Ohio
Samuels, A. H., Los Angeles 48, Calif.
Sanders, J. G., San Leandro, Calif.
Schwartz, P., Hicksville, L. I., N. Y.
See, C. J., Ferguson 21, Mo.
Sharp, R. R., Des Moines, Iowa
Sheets, G., Washington 6, D. C.
Sherrill, P. N., Menlo Park, Calif.
Solomon, A. N., Somerville 44, Mass.
Speranza, A. A., Jr., Yonkers, N. Y.
Steeb, E. F., Scott AFB, Ill.
Stupica, V. A., Hamilton, Ont., Canada
Swank, G. D., El Paso, Tex.
Terkla, M. G., Glendale 5, Calif.
Torres, G. A., Jujuy, Argentina
Tuvia, L., Hakirya, Tel Aviv, Israel
Ubbelohde, J. H., Westmount, Que., Canada
Urschel, A. K., Geneva, Nebr.
Van-Nostrand, P. B., Little Neck 62, L. I., N. Y.
Vaughan, J. D., Winslow, Ind.
von Buelow, R., Santa Monica, Calif.
Whitacre, R. N., Mountain View, Calif.
White, P. W., Ottawa, Ont., Canada
White, R. A., Chappaqua, N. Y.
Whitfield, W. D., Sacramento, Calif.
Witsiepe, R. E., Jr., San Francisco, Calif.
Wong, S. C., Scott AFB, Ill.
Woodin, V. E., El Paso, Tex.
Woodman, B. H., Montreal 28, Que., Canada
Zinsser, H. H., Los Angeles 33, Calif.
Zukauskas, P. J., Baltimore 20, Mo.



new!

Microdot® Brochure

...How to use the world's smallest, lightest coax

Write for our helpful free Brochure illustrating the world's only complete line of microminiature Coax Connectors, Cables, Tools and Assemblies, including Mininoise® Cable to reduce self-generated noise 99%.

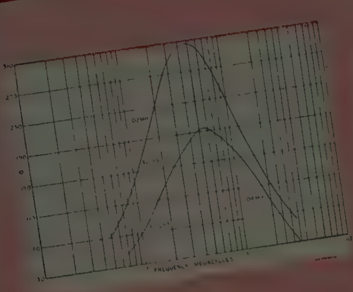
MICRODOT
1826 FREMONT AVENUE
SO. PASADENA • CALIF.

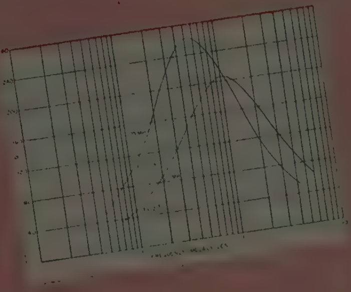
FEATURING TEMPERATURE COEFFICIENTS AS LOW AS
10 PARTS PER MILLION PER °C. BETWEEN —55° AND +85°

PRODUCTS OF
QUALITY — DEPENDABILITY
RESULTS OF
EXTENSIVE ENGINEERING

NEW FREED
HIGH FREQUENCY — HIGH "Q" TOROIDAL INDUCTORS

HIGH FREQUENCY
ROIDAL INDUCTORS
aturing very high Q,
nperature stabiliza-
n and low pickup
lizing the latest ma-
ials and techniques.





TI-20S
14 stock values from 0.05 Mhy. to 4.5 Mhy.

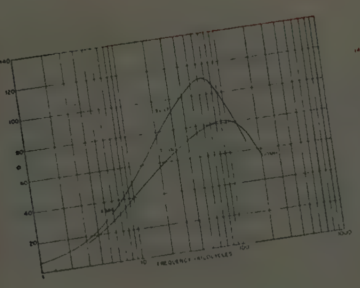
TI-23S
15 stock values from 10 Mhy. to 700 Mhy.

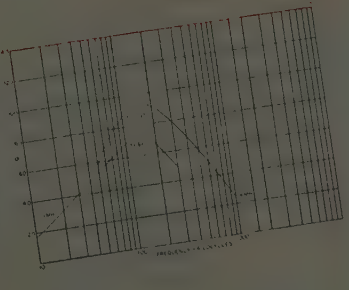
TI-21S
15 stock values from .01 Mhy. to 1 Mhy.

TI-22S
10 stock values from 10 Mhy. to 150 Mhy.

	OD	H
TI-20	1"	9/1
TI-21	5/8	5/1
TI-22	7/8	3/8
TI-23	7/8	3/8

Can be supplied hermetically-sealed, encapsulated or in a metal can.





TI-16
20 stock values from .1 Mhy. to 100 Mhy.

TI-17
18 stock values from .1 Mhy. to 100 Mhy.

TI-18
18 stock values from .1 Mhy. to 100 Mhy.

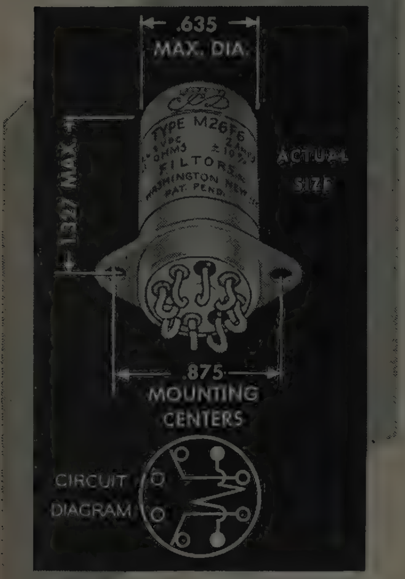
TI-19
13 stock values from .1 Mhy. to 5 Mhy.

THESE TOROIDS AR
FEATURING HIGH
AND SUBMINIATUR
SIZE. Our unique wind-
ing and impregnatio
process insures ver
low distributed capac-
ity and consequentl
self-resonant frequen-
cies far removed fro
the operating range.

NOW AVAILABLE FROM STOCK FOR IMMEDIATE DELIVERY

FREED TRANSFORMER CO., INC.
1720 WEIRFIELD ST., BROOKLYN (Ridgewood) 27, NEW YORK

NEW DPDT
SUB-MINIATURE RELAY
by
FILTORS, INC.



ENGINEERED FOR CRITICAL AIRBORNE AND GUIDED MISSILE APPLICATIONS

This Relay Meets the Requirements of
MIL-R-5757B and
MIL-R-25018 (USAF).

Two Form C contacts are rated at 2 amps, resistive, at 29 V.D.C. or 115 V.A.C.

Withstands operational shock of 50 G's and operational vibration of 5 to 2000 CPS at 10 G.

AMBIENT TEMPERATURE RANGE: —65°C to +125°C

WEIGHT: 1.3 ounces

OPERATE TIME: 10 milliseconds or less.

RELEASE TIME: 5 milliseconds or less.

Send for NEW CATALOG

FILTORS, Inc. PR
20 Sagamore Hill Dr.,
Port Washington, L.I., N.Y.
PLEASE SEND RELAY CATALOG
NAME ....
COMPANY .... TITLE ....
CITY .... STATE ....

IRE People

Gerald C. Rich

Gerald C. Rich (A'36–SM'49) of Los Altos has been appointed Manager of the Microwave Tube Laboratory of Sylvania Electric Products Inc. at Mountain View, California.

Mr. Rich, Manager of Technical Liaison at the Electronic Defense Laboratory, a sister installation of MTL at Mountain View, succeeds Richard B. Leng who resigned.

A veteran of nearly 20 years, service with Sylvania, Mr. Rich was named to the post by Howard L. Richardson, Vice-President—Operations, who supervises Sylvania's electronic research and laboratory activities.

Mr. Rich is a native of St. Johnsbury, Vermont, where he attended school prior to enrolling at Massachusetts Institute of Technology where he received the B.S. degree in 1935. He immediately joined the Tube Engineering Section of Sylvania at Salem, Massachusetts, and was transferred five years later to Kew Gardens, New York as a Technical Group Leader.

During World War II, he served in the Coast Artillery and the Signal Corps, seeing special service in Moscow as Signal Officer. He left the Army with the rank of lieutenant colonel.

After spending four years in Phoenix as a research project leader, he joined Sylvania's Electronic Defense Laboratory as head of the Microwave Section.

He helped found the Phoenix chapter of the IRE. He is a member of the American Physical Society.

❖

Nathaniel B. Nichols

Nathaniel B. Nichols (SM'53) has been named Manager of Raytheon Manufacturing Company's commercial equipment engineering activities. He was formerly manager of the firm's research division.

The appointment is part of Raytheon's reorganization of its equipment operations designed to establish separate facilities for government and commercial products.

Mr. Nichols received his education at Central Michigan College and the University of Michigan. During World War II, he was associated with the Radiation Laboratory of the Massachusetts Institute of Technology, where he headed the servo group of the fire control division. Subsequently, he became research director of the Taylor Instrument Companies, leaving in 1950 to accept a professorship in electri-

(Continued on page 72A)

ALSIMAG®

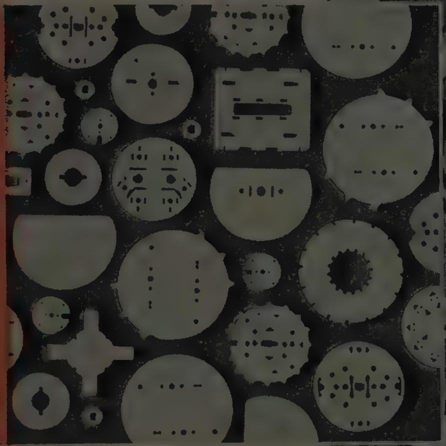
advanced ALUMINA CERAMICS

with new HIGH

temperature
strength
quality
production

Greatly enlarged facilities now produce high quality, pace-setting AlSiMag Alumina ceramics in quantity lots. Complete range of up-to-the-minute Alumina compositions now permit you to design to higher temperatures and higher strengths. Advantages include improved electrical characteristics at elevated temperatures—beyond the melting point of most metals. Higher tensile and impact strengths. Greater resistance to corrosion and abrasion. Smoothness of texture. Close dimensional tolerances. Custom formulations for special needs.

Volume production in a complete range of precision parts, including electron tube shapes processed to be highly porous, readily degassed, thicknesses as low as .009″.



- An outline of your requirements, enclosing a blueprint or sketch, will bring you full details.

54TH YEAR
OF CERAMIC
LEADERSHIP

AMERICAN LAVA CORPORATION

CHATTANOOGA 5, TENNESSEE
A Subsidiary of
Minnesota Mining and Manufacturing Company

Branch offices in these cities (see your local telephone directory): Cambridge, Mass. • Chicago, Ill. • Cleveland, Ohio • Dallas-Houston, Texas • Indianapolis, Ind. • Los Angeles, Calif. • Newark, N. J. • Philadelphia, Pa. • St. Louis, Mo. • South San Francisco, Calif. • Syracuse, N. Y. • Tulsa, Okla. Canada: Irvington Varnish & Insulator Div., Minnesota Mining & Mfg. of Canada, Ltd., P. O. Box 757, London, Ontario. **All other export:**

You are invited to the

2nd National Symposium

on

Reliability and Quality Control

in Electronics

Washington, D.C.
Hotel Statler

Monday, Tuesday
January 9, 10, 1956

9 Sessions • 18 Papers
1 Movie • 1 Panel Discussion
Nationally Known Speakers
Luncheon
Visit to Gov't Laboratory

For information on Registration, Hotel Rooms, Trips, write to Victor Wouk, Publicity Chairman, Beta Electric Corp., 333 E. 103rd Street, New York 29,

or

Max Tall, Registration Chairman
Vitro Corp. of America
962 Wayne Avenue
Silver Spring, Maryland

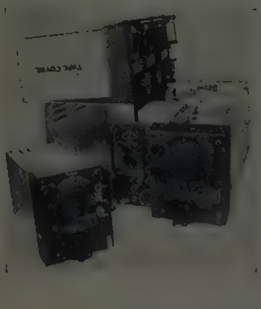
Sponsored by IRE Professional Group on Reliability and Quality Control,

and co-sponsored by

The Electronics Division of the American Society for Quality Control

and

the Staff Committee on Quality Acceptance Procedures of the Radio-Electronics-Television Manufacturers Association.



AN/APR-4 LABORATORY RECEIVERS

Complete with all five Tuning Units, covering the range 38 to 4,000 Mc.; wideband discone and other antennas, wavetraps, mobile accessories, 100 page technical manual, etc. Versatile, accurate, compact—the aristocrat of lab receivers in this range. Write for data sheet and quotations.

We have a large variety of other hard-to-get equipment, including microwave, aircraft, communications, radar; and laboratory electronics of all kinds. Quality standards maintained. Get our quotations!

NEW TS-13/AP X-BAND SIGNAL GENERATORS, with manual, $575.00 . . . T-47A/ART-13 Transmitters, $450.00 . . . H-P, Boonton, G-R, Measurements, and other standard items in stock; also nucleonic equipment.

ENGINEERING ASSOCIATES
434 PATTERSON ROAD
DAYTON 9, OHIO

(Continued from page 70A)

cal engineering at the University of Minnesota.

Mr. Nichols holds memberships in the American Physical Society, the American Chemical Society, the Instrument Society of America, the American Society for Advancement of Science, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers.

❖

Robert A. Watson-Watt (SM'46–F'47), credited with the discovery and development of radar, has been named President and Board Chairman of Logistics Research, Inc., Redondo Beach, California, designers and manufacturers of electronic computers. Sir Robert also invented the high-frequency radio direction finder used in anti-submarine warfare.

❖

Harold Vagtborg, president of Southwest Research Institute, San Antonio, Tex., has announced the appointment of **S. H. Simpson, Jr.** (A'39–VA'39–SM'48), former manager of communications research, as Assistant Vice-President concentrating on coordination of the Institute's research program for industry, business, and the military services.

Mr. Simpson, a specialist in commercial and military communications research and in engineering administration, was Assistant Vice-President with RCA Communications, Inc., before coming to SwRI in 1953, and previously directed the worldwide communications activities of the U. S. Office of Strategic Services during World War II.

❖

Russell C. Sergeant, USN, (M'54) has transferred to duty with the Bureau of Ships as head of the Countermeasures Branch, electronics design and development division. Commander Sergeant served seven years in electronic countermeasures research and development, electronics division, in the Office of the Chief of Naval Operations prior to his most recent two-and-one-half years' duty as Director of the Technical Division at the Navy's Electronic Supply Office, Great Lakes, Illinois.

❖

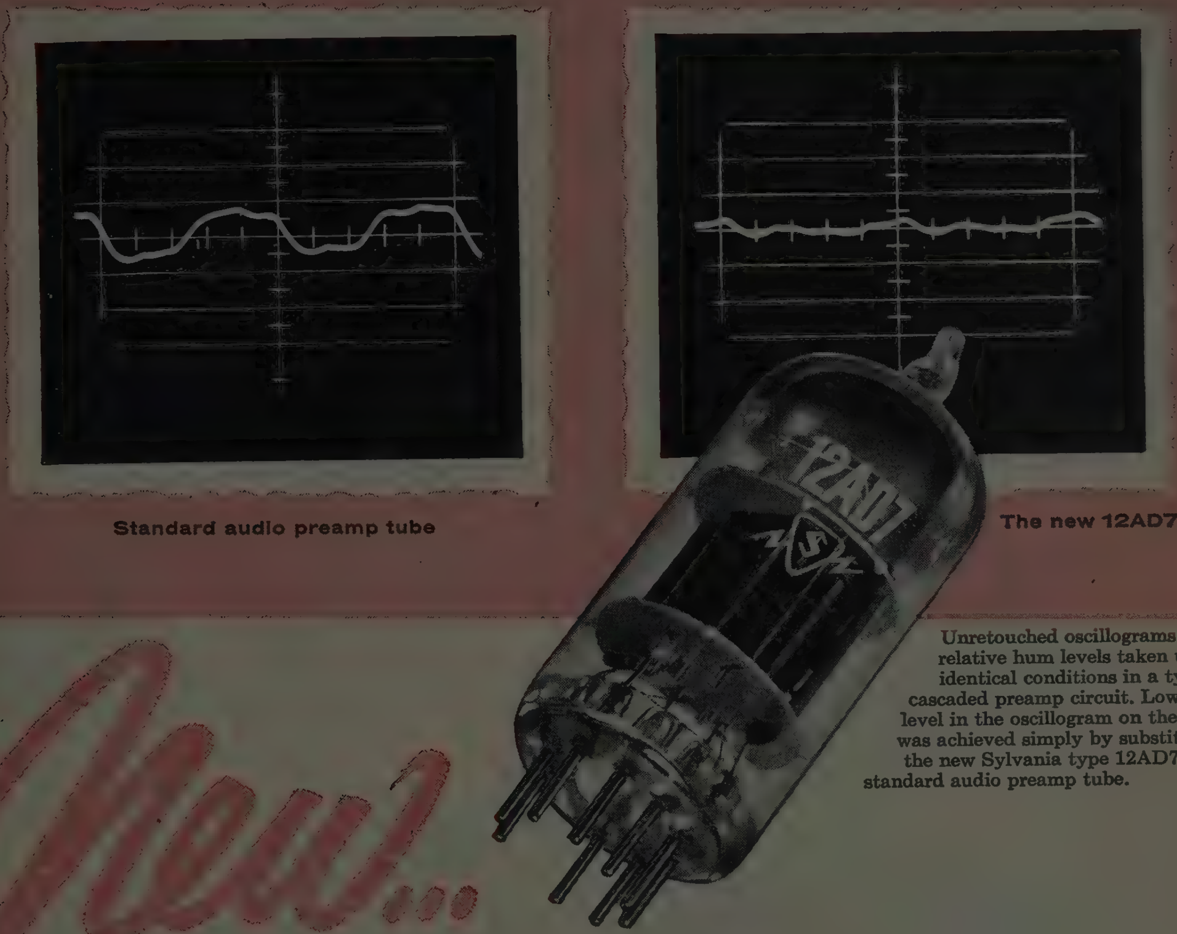
The appointment of **Cecilie Froehlich** (A'49) to the chairmanship of the Electrical Engineering department, City College of New York, has been announced. Prof. Froehlich's association with the department dates from 1942. She succeeds Henry B. Hansteen.

Prof. Froehlich received the Ph.D. degree in mathematics from the University of Bonn, Germany, in 1925.

She served as a technical scientific

(Continued on page 74A)

Closest thing yet to zero hum level



Standard audio preamp tube

The new 12AD7

Unretouched oscillograms show relative hum levels taken under identical conditions in a typical cascaded preamp circuit. Low hum level in the oscillogram on the right was achieved simply by substituting the new Sylvania type 12AD7 for a standard audio preamp tube.

New...

Sylvania 12AD7... the low-hum, low-micro preamp tube you've been waiting for

Sylvania has been working two full years to bring you an audio preamp tube with exceptionally low hum and micro characteristics. It is a 9-pin miniature, high mu (100) double triode.

You can incorporate the new 12AD7 into both existing and new audio equipment designs . . . with improved performance.

The 12AD7 reduces cost of incoming inspection for low hum. That's because the 12AD7 has been circuit designed, and circuit tested for minimum hum and microphonism.

Write for complete details on the new 12AD7 plus these other important Sylvania audio tube types

6SN7GTA **6L6GB**
6V6GT
12AU7A **12AX7**

SYLVANIA®

Sylvania Electric Products Inc.
1740 Broadway, New York 19, N. Y.
In Canada: Sylvania Electric (Canada) Ltd.
University Tower Bldg., Montreal

LIGHTING · RADIO · ELECTRONICS · TELEVISION · ATOMIC ENERGY

For

High Voltage,

High Current

CAPACITANCE

. . . in small space

. . . and *trouble-free*

For lump capacitance at high voltage and/or high current, Lapp Gas-Filled Condensers offer the advantages of extreme compactness . . . low loss . . . high safety factor . . . elimination of puncture hazard . . . construction with gaskets which can be externally tightened under full operating pressure . . . assurance of *long trouble-free service.* Variable and fixed units are available with capacitances to 30,000mmf; current ratings to 400 amps at 1 mc; operating voltages to 80 Kv peak. Write for Bulletin 302 with complete description and characteristics data. Lapp Insulator Co., Inc., Radio Specialties Division, 256 Sumner St., Le Roy, N. Y.

I R E People

(*Continued from page 72A*)

assistant to the vice-president of the Allgemeine Electricitaets Gesellschaft in Berlin, Germany, from 1927 to 1937. From 1937 to 1941 she was an engineer and mathematical consultant with the Ateliers Constructions Electriques de Charleroi, Belgium. On a recent sabbatical leave, Prof. Froehlich spent a year as technical research consultant with the Federal Telecommunication Laboratories in Nutley, N. J.

She was the first woman professor to be initiated into Eta Kappa Nu. She holds a woman's badge in Tau Beta Pi, and is a member of the American Institute of Electrical Engineers, American Society for Engineering Education, and the Society of Women Engineers.

❖

David R. Baldauf (A'52) Endicott, N. Y., has been named a Project Engineer in the Airborne Computer Laboratory of International Business Machines (IBM). In February, 1952, he was hired as a design engineer and assigned to the Airborne Computer Laboratory. Two years later he was named associate engineer.

David R. Baldauf

A native of Massillon, Ohio, he attended elementary and high schools there. He studied pre-engineering in Ohio Wesleyan University and Kent State University, and in 1952 earned the Bachelor of Science degree in electrical engineering at Purdue University. Mr. Baldauf is a member of Tau Beta Pi, Eta Kappa Nu and Tau Kappa Alpha. He has completed a course in Semi-Conductors of Electricity II in the IBM School.

During World War II he served with the U. S. Navy in the Mediterranean area.

❖

Louis D. Smullin (S'39–A'40–SM'51), has been named Associate Professor in the department of electrical engineering of Massachusetts Institute of Technology. He has served on the staffs of the Institute's Radiation Laboratory (1941–46), Research Laboratory of Electronics (1947–50), and Lincoln Laboratory, where he is currently a division head and member of the steering committee.

Graduated in 1936 from the University of Michigan, Mr. Smullin received the degree of master of science at M.I.T., and prior to World War II was active in industrial research. From 1946–47 he headed the Microwave Tube Group at the Federal Telecommunications Laboratory in Nutley, New Jersey.

(*Continued on page 76A*)

AMAZING POWER

TYPE X-80
MADE IN U.S.A
UNITED ELECTRONICS COMPANY

TYPE X-80
CLIPPER DIODE-RECTIFIER

High peak power capabilities of type X-80 in relation to its physical size have been accomplished through an unusually forceful combination of design features.

1. Exclusive UNITED bonded *thoria tungsten core filament* for high electron emissivity.

2. Exclusive UNITED *graphite anode* for maximum thermal dissipation.

3. Exclusive UNITED *isolated getter traps* for retention of hard vacuum and high voltage internal insulation.

Type X-80 is serving importantly as a high current clipper tube in radar equipment employing the large hydrogen thyratrons, as well as in power supply rectifier applications.

Write for detailed specifications.

40 Kilovolts Inverse Peak	80 Amperes Peak Plate Current as shunt diode
800 mAdc (average) as a rectifier	Filament Ratings 11.5 Volts Nominal 15.5 Amperes

UNITED ELECTRONICS, 42 Spring Street, Newark 4, N. J.

NEW! MINIATURE SERVO

Magnetic Amplifiers

MAGNETIC AMPLIFIERS INC
632 TINTON AVENUE
NEW YORK 55, N.Y.
MAGNETIC AMPLIFIER
MODEL NO
SERIAL NO

Three New AC Servo Types Available..

115 VOLTS
60 or 400 cps.
INPUT NO. 1
INPUT NO. 2

STANDARDIZED SERVO SYSTEMS AND OTHER STANDARD TYPES FOR AUTOMATIC CONTROL —

In addition to new lines illustrated, many standard and higher power magnetic amplifiers are available for applications involving automatic control.

CUSTOM DESIGNS FOR SPECIAL REQUIREMENTS

— we design and engineer complete servo or automatic control systems

- MAGNETIC PRE-AMP + SATURABLE TRANSFORMERS
  Supply: 115 volt 400 cps.
  Power output: 3.5, 6, 10, 18 watts
  Sensitivity: 1 volt AC
  Response Time: .03 sec.
  Lowest Cost — Smallest Size
  For further information request Form S493
- MAGNETIC PRE-AMP + HIGH GAIN MAGNETIC AMPLIFIER
  Supply: 115 volt 400 cps.
  Power output: 5, 10, 15, 20 watts
  Sensitivity: .1 volt AC
  Response Time: .008 to .1 sec.
  Highest performance — All magnetic
  For further information request Form S496
- TRANSI-MAG*: TRANSISTOR + HIGH GAIN MAGNETIC AMPLIFIER
  Supply: 115 volt 400 or 60 cps.
  Power output: 2, 5, 10, 15, 20 watts
  Sensitivity: .08 volt AC into 10,000 ohms
  Response Time: .01 sec.
  Fast response at high gain
  For further information request Form S499 (400 cps.); Form S497 (60 cps.)

*TRADE NAME

AFFILIATE OF THE GENERAL CERAMICS CORPORATION

MAGNETIC AMPLIFIERS • INC
Telephone: CYpress 2-6610
632 TINTON AVE., NEW YORK 55, N. Y.

(Continued from page 74A)

Richard B. Leng (SM'53) has been elected to the newly created position of Vice-President in charge of the technical products division of Packard-Bell Company.

RICHARD B. LENG

Mr. Leng has had 20 years' engineering and management experience in the electronics industry with Sylvania Electric, RCA, and Raytheon. He joins Packard-Bell after resigning as manager of California Operations for Sylvania Electric. His engineering training was obtained at the Polytechnic Institute of Brooklyn, and he received a graduate engineering degree from New York University. He has also taught engineering and management courses at Pratt Institute in Brooklyn and Northeastern University.

Mr. Leng is a member of the American Society of Mechanical Engineers, the Society for the Advancement of Management, and the American Society of Engineering Education, as well as various defense and ordnance groups.

❖

Thomas J. Killian (A'47–SM'47–F'51), former dean of the Catholic University Engineering School, Washington, D. C., has been appointed Deputy Chief and Chief Scientist of the Office of Naval Research, Washington, D.C. He succeeds E. R. Piore, who has been appointed chairman of the Committee on Advance Research of the AVCO Manufacturing Co.

❖

Edward B. Doll (A'38–SM'47) has joined the staff of The Ramo-Wooldridge Corporation, Los Angeles, as Director of the Project Control Staff, Guided Missile Research Division.

EDWARD B. DOLL

Dr. Doll's twenty-one years' experience includes general electronic circuit design, magnetic instrumentation, degaussing, weapons fusing and firing systems, weapons systems analysis, weapons effects, field instrumentation, television and radio engineering. He served as technical director for two major special weapons programs for the Air Force, and was commended by the U. S. Navy and the Secretary of Defense for his work on the Man-

(Continued on page 78A)

CASCADE RESEARCH

Z-Scope

VISUAL MICROWAVE IMPEDANCE PLOTTER

Z-scope, an exclusive Cascade Research development, provides a complete visual presentation of the impedance characteristics of a microwave antenna or other load over the entire X band.

PRESENTATION CABINET

Z-scope has no moving mechanical elements, is wholly electronic in operation. Samples of the direct and reflected waves are obtained through directional couplers and then passed through a waveguide labyrinth. They are combined in two crystal detectors in such a way that the outputs are proportional to R cos θ and R sin θ, the horizontal and vertical components of the reflection coefficient vector. When these voltages are applied to the deflection plates of the 7″ C-R tube, the light spot moves to the end of the reflection coefficient vector. Impedance is then read on a transparent Smith chart mounted on the C-R tube face.

If an oscillator, (not supplied) is swept over a wide frequency range, a curve of impedance vs frequency is obtained immediately. Previously, this curve could be obtained only by lengthy point-by-point measurement and plotting.

A microwave AGC contained within the Z-scope maintains a constant microwave power level essentially independent of variations in input power. This microwave AGC can also be purchased separately.

SAVE HOURS OF VALUABLE ENGINEERING TIME ON SMITH CHART PLOTTING PROBLEMS

OTHER APPLICATIONS

ASSISTS IN MICROWAVE IMPEDANCE ADJUSTMENTS:

Permits operator to see effects of tuning adjustments throughout entire frequency range or at specific points.

VALUABLE IN PRODUCTION TESTING:

Stop-go limits visually established by employing pre-calibrated reticle on face of cathode ray tube.

ASSISTS IN ATTENUATION MEASUREMENTS:

The internal microwave AGC provides constant power into the load. The use of a power level detector permits a direct reading of insertion loss of the component under test.

SPECIFICATIONS

MODE OF PRESENTATION: Smith chart, regular or expanded types.

FREQUENCY RANGE: 8.2 to 12.4 kmc.

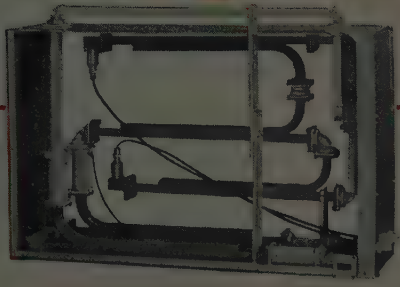
IMPEDANCE RANGE:
1.02< VSWR< ∞ (Smith chart)
1.02< VSWR< 2.0 (Expanded Smith chart)

ACCURACY: 6% of reflection coefficient or 1.02 VSWR whichever is greater. (Greatest error for high VSWR)

PRESENTATION SWEEP RATE: 30 cps.

MICROWAVE POWER INPUT: 10 mw to 1W.

WAVEGUIDE: ½″ x 1″ (RG-52/U)



MICROWAVE LABYRINTH CABINET
(side covers removed)

Z-scope consists of 2 basic elements:

(1)—Presentation cabinet, 14½″ wide, 17″ high, 22″ deep. Contains all low frequency circuitry, power supplies, oscilloscope, etc.

(2)—Microwave cabinet, 7¼″ wide (plus flanges) 17½″ high, 26″ deep. Contains directional couplers, delay sections, detectors and GYRALINES, one of which is used for AGC.

Write for complete technical literature

CASCADE RESEARCH CORPORATION LOS GATOS, CALIF.

MERIT COIL starts with
the **FINEST** . . ***GARFIELD WIRE***
to end with
the **BEST** . . ***COILS and TRANSFORMERS***

Merit Coil and Transformer Co., of Chicago, is known for precision-engineered coils and transformers. When distributors can't take chances with anything less than the best, they specify **MERIT.**

And **MERIT** specifies **GARFIELD WIRE** every time! They know they can't go wrong with Garfield, whose modern equipment and stringent quality standards produce tolerances **closer** than **NEMA** standards.

When **you** specify Garfield you are **SURE** of getting **UNIFORMITY**—and top **SERVICE** along with **QUALITY.**

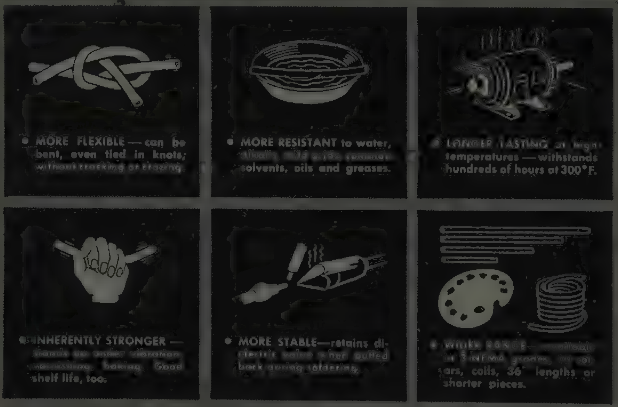
Write for your copy of our specifications chart on bare, wire, plain and heavy enamel additions.

GARFIELD WIRE DIVISION
of The Overlakes Corporation

142 Monroe St., Garfield, N.J. **GRegory 2-3661—2**

Where can *you* use VARFLO?

(the highly flexible Class B Sleeving and Tubing that licks Class A in performance - equals it in price)


• MORE FLEXIBLE — can be bent, even tied in knots, without cracking or crazing.
• MORE RESISTANT to water, alkalis, mild acids, common solvents, oils and greases.
• LONGER LASTING at high temperatures — withstands hundreds of hours at 300° F.
• INHERENTLY STRONGER — stands up under vibration, varnishing, baking. Good shelf life, too.
• MORE STABLE—retains dielectric value when pulled back during soldering.
• WIDER RANGE — available in 3 NEMA grades, in colors, coils, 36" lengths or shorter pieces.

Cuts inventory, too! Superior to Class A insulation in performance—yet on a par with it in price—Varflo Sleeving and Tubing can be used economically for all Class A and Class B installations. This low-cost adaptability of Varflo enables many of our customers to achieve substantial savings in inventory. Available in NEMA Grades A-1 and B-1 tubing and Grade C-2 sleeving. Perhaps Varflo can solve your insulating problems. Describe them in a letter—no cost or obligation for our recommendations.

Send for FREE Test Samples

Varflex
CORPORATION
Makers of Electrical Insulating Tubing and Sleeving

518 W. Court St., Rome, N. Y.

IRE People

(Continued from page 76A)

hattan District project.

Dr. Doll received the B.S. in applied physics, M.S. and Ph.D. degrees from the California Institute of Technology where he was also a teaching fellow. He was also an Associate Professor in electrical engineering at the University of Kentucky.

He holds a Tau Beta Pi Fellowship, and is a member of the American Institute of Electrical Engineers.

❖

The appointment of **Lloyd E. Swedlund** (A'31–SM'45) as Manager of monochrome tube product engineering in the General Electric Cathode Ray Tube Sub-Department has been announced by Dr. Leonard C. Maier Jr., manager of engineering.

Mr. Swedlund was graduated from the University of Colorado in 1926 with the B.S. degree in electrical engineering and from the California Institute of Technology in 1928 with the M.S. degree in electrical engineering. He joined GE in February, 1954 in the cathode ray tube engineering section where he has been employed until his present appointment.

Mr. Swedlund is an associate member of the Society of Motion Picture and Television Engineers, a member of JTC-6 Cathode Ray Tube committee and chairman of the JTC-6.9 sub-committee of RETMA.

❖

Michael J. Di Toro (A'37–SM'45) has joined the Polytechnic Research and Development Co., Inc., in Brooklyn, N. Y. As chief electronic Engineer, Dr. Di Toro will be responsible for the planned expansion into different electronic fields. He has formerly been connected with several major electronic laboratories where he filled important positions and was instrumental in the development of electroacoustical transducers, telemetering, delay lines, speech compression, noise reduction, submarine detection and long-range radio communication systems. He has presented over 30 papers and holds more than 40 patents. For a time he was Associate Director of the Microwave Research Institute of the Polytechnic Institute of Brooklyn.

M. J. Di Toro

An alumnus of the Polytechnic Institute of Brooklyn, Dr. Di Toro is the recipient of three degrees from that school, including the Doctor's degree in electrical

(Continued in on page 80A)

announcing an
extra
sensitive
miniature relay

It's the new ADVANCE SQ—a telephone type that hits a new high in ruggedness and efficiency!

Only 15 milliwatts per pole will operate the new SQ relay in the DPDT combination. Here is sensitivity teamed with stable performance—the DPDT unit withstands 10 G's vibration from 10 to 500 cycles. When power is increased to 40 milliwatts per pole, vibration resistance rises to 30 G's. A single-coil relay, the ADVANCE SQ is available in 1- to 5-amp contact ratings, and in contact combinations from SPST to 6PDT. It comes through Signal Corps tumbling and shock tests in excess of 200 G's with operating characteristics unimpaired.

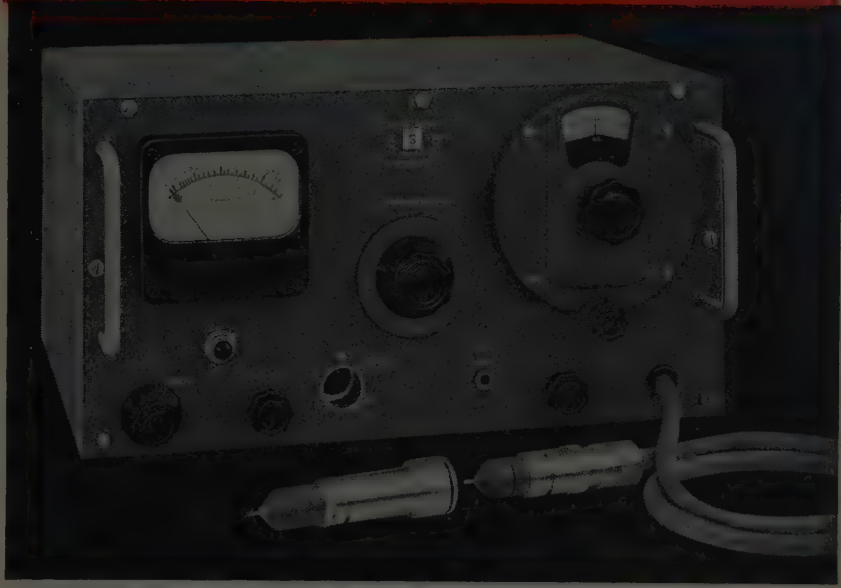
Sustained efficiency keynotes SQ operation. The use of a beryllium copper armature retaining spring insures positive contact between armature and pivot points at all times. Cross-bar palladium contacts are always properly aligned. A wide variety of coil resistances is feasible. Instead of organic insulation, the unit employs Silicone glass, Kel-F, or Teflon tubing. Life expectancy for 5-amp, non-inductive loads is 150,000 cycles... for 1-amp, non-inductive load: 1,000,000 cycles.

Open type dimensions are 1″ x ¾″ x 1⁵⁄₁₆″. DPDT units are supplied in a sealed container measuring 1″ x 1″ x 2″. Write for literature on the SQ series.

ADVANCE ELECTRIC AND RELAY CO.
AN ELGIN NATIONAL WATCH COMPANY AFFILIATE
2435-G NORTH NAOMI ST.
BURBANK, CALIFORNIA

Sales Representatives in Principal Cities of U.S. and Canada

New hf wave analyzer!



Sierra 158 High Frequency Wave Analyzer

Fast, convenient, 500 KC to 10 MC!

New Sierra 158 Analyzer is a highly selective, double superheterodyne receiver providing wave analysis data direct in dbm referred to 600 ohms impedance. The instrument uses a cathode follower input probe with two detachable capacity dividers for 20 or 40 db attenuation. It also includes a built-in attenuator adjustable in 10 db steps to a maximum of 60 db. These features, in combination with 22 db usable meter readings, provide a measurement range of 122 db, from —80 to +42 dbm. A measurement accuracy of ±2 db is assured for levels above —70 dbm. Spurious components from analyzer circuits are at least 50 db below fundamental. An injection oscillator at 2 mc is provided for rapid voltage calibration. A phone jack is available for aural monitoring. The instrument also includes the Sierra-designed precision spiral-scale frequency dial. *Write for complete data.*

SPECIFICATIONS

Frequency Range: 0.5 to 10 megacycles.

Signal Measurement Range: —80 dbm to +42 dbm, referred to 600 ohms. (77.5 μv to 97.5 v)

Selectivity: 3 db down at 3 kc off; 30 db down at 12 kc off.

Signal Measurement Accuracy: ±2 db above —70 dbm.

Spurious Responses: At least 50 db down.

Input Impedance: Greater than 1 megohm shunted by approximately 8 $\mu\mu$f.

Frequency Calibration Accuracy: Depends on stability and calibration accuracy of the 22.5 - 32 mc variable oscillator, which is maintained within 0.25%. This results in dial accuracy ranging from ±.056 mc to ±.080 mc.

Operating Power Requirements: 105 to 125 volts, 50/60 cps, 95 watts drain.

Cabinet Dimensions: 17 inches wide, 9⅞ inches high, 13½ inches deep.

Weight: Approximately 40 pounds.

Data Subject to Change Without Notice

Sierra Electronic Corporation
San Carlos 2, California, U. S. A.
Sales representatives in major cities
Manufacturers of Carrier Frequency Voltmeters, Wave Analyzers, Line Fault Analyzers, Directional Couplers, Wideband RF Transformers, Custom Radio Transmitters, VHF-UHF Detectors, Variable Impedance Wattmeters, Reflection Coefficient Meters.
3238

Stupakoff

ALUMINA CERAMICS

METALLIC
OXIDES

These man-made "sapphires" provide

EXTRA strength . . .
EXTRA hardness . . .
EXTRA precision . . .

For mechanical, electrical and electronic applications, Stupakoff Alumina Ceramics provide highly valuable characteristics. Because they are exceptionally hard, parts made of this material serve well under conditions of abrasion and wear. Because of the material's high strength, it finds many applications where its resistance to pressure, shock and impact adds to the life and service of an assembly. Because Stupakoff has the equipment and skill to mass-produce alumina parts with dimensions held to close tolerances, Stupakoff precision ceramics assemble readily and function correctly.

Parts may be simple or complex, ground or machined, plain, metallized or assembled. Our research and engineering facilities are available to assist in the design of your parts.

Write Dept. P.

Stupakoff
Division of The CARBORUNDUM Company
LATROBE, PENNSYLVANIA

(Continued from page 78A)

engineering. He is a member of Eta Kappa Nu and Sigma Xi, and a Fellow of the Acoustical Society of America. He serves the IRE as a member of the Professional Group on Information Theory.

Dr. Di Toro is also Adjunct Professor at the Graduate School of Electrical Engineering of the Polytechnic Institute of Brooklyn, where he teaches evening courses in communications.

❖

Russell D. O'Neal (SM'50) has been named Director of Weapons Systems Planning of the Bendix Aviation Corporation, according to an announcement by Malcolm P. Ferguson, president of the company.

Dr. O'Neal, with headquarters in Detroit, will head an expanded program of development and production of modern weapons systems, such as guided missiles. "He will more closely coordinate the various operating divisions of Bendix and divisional staff engineers, whose skills are necessary for continued progress in the creation of modern weapons," Mr. Ferguson said.

Dr. O'Neal received the A.B. from DePauw University in 1936, and the Ph.D. in physics from the University of Illinois. While teaching physics at Illinois, he published numerous papers on nuclear physics.

In 1941, he became a staff member of the Massachusetts Institute of Technology where he engaged in the development of radar. In 1949, he became assistant director of the Willow Run Research Center of the University of Michigan and, in 1951, was made director of the Center in charge of electronic and guided missile work.

He served as chairman of a panel of the National Research and Development Board from 1949 to 1953. In 1953, he became assistant division manager of Consolidated Vultee Aircraft Corporation, Fort Worth, Tex. He is a member of the American Nuclear Society, and the Atomic Industrial Forum.

❖

Du Mont's organization for the marketing of the Electronicam TV-Film system has been expanded with the appointment of **John S. Auld** (A'54) as manager of technical operations. The announcement was made by James L. Caddigan, director of "Electronicam" marketing for Allen B. Du Mont Laboratories, Inc.

Mr. Auld will work with Du Mont clients throughout the country in planning, laying out, and installing "Electronicam" systems in movie studios, TV film production centers, television stations, and in educational, governmental and industrial installations.

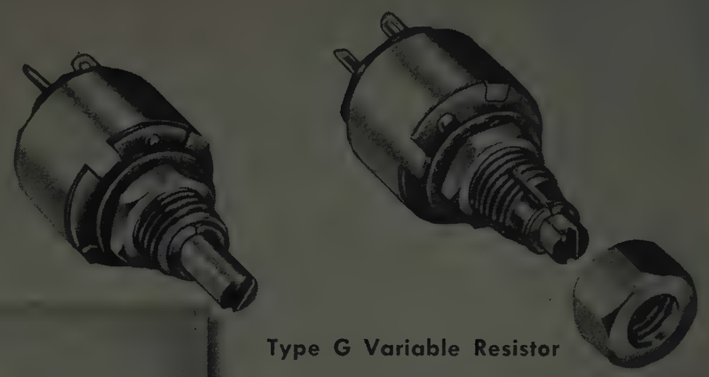
Mr. Auld, who joined Du Mont in 1948

(Continued on page 82A)

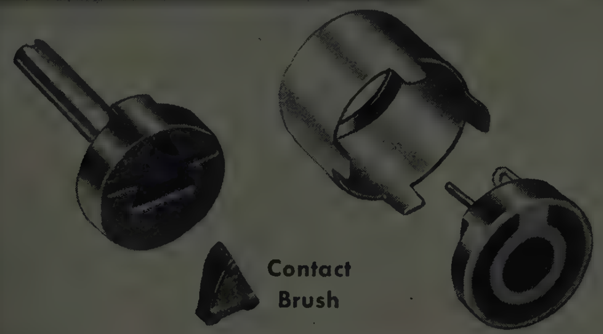
ACTUAL SIZE

Type G Variable Resistor

ENLARGED VIEW



Type G Variable Resistor



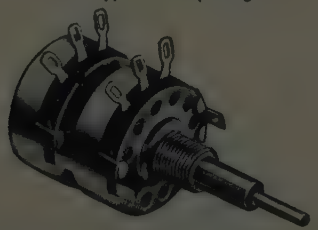
HIGH QUALITY

TYPE G

Continuously Variable 1/2 Watt Resistors

Type T Resistor
A ½ watt variable resistor has 2 styles of operating covers—for hand or screwdriver adjustment.

Type J Resistor
A 2 watt solid molded variable resistor available with various types of adjusting shafts.



Dual Type J Resistor with Concentric Shafts
Two units with separate, concentric adjusting shafts for individual circuit control.

Solid Molded Resistor Assures Long Life, Low Noise, and Permanent Characteristics

The tiny Allen-Bradley Type G, ½ watt variable resistor is a miniature version of the well-known Type J 2 watt variable resistor. It has a solid-molded resistor element progressively tapered in resistance to produce any resistance-rotation curve.

The graduated resistor element is NOT a painted or sprayed unit. The Type G element—being solid molded—does not deteriorate with age or use. It is not affected by heat or moisture. It is conservatively rated at ½ watt at 70 C ambient . . . not at the usual 40 C. The carbon contact brush improves with use. The Type G unit is a QUALITY product, through and through . . . made for electronic applications where performance is the dominant requirement.

Let us send you full technical data on Allen-Bradley variable resistors. Write today.

Allen-Bradley Co.
114 W. Greenfield Ave.
Milwaukee 4, Wis.

A-B
Quality

In Canada—
Allen-Bradley Canada Ltd.
Galt, Ont.

ALLEN-BRADLEY

RADIO, ELECTRONIC AND TELEVISION COMPONENTS

Need special transformers fast?

You can get them from us, engineered to your specifications and produced faster than you may think possible.

Our staff of design engineers have long experience in communications. They know how to design around special problems of size, weight, high voltage or temperature; and they understand over-all circuit requirements. They can design what you need.

And our manufacturing and inspection facilities can put the engineers' design into quality-controlled production in a remarkably short time.

When you have a transformer problem, call on

CALEDONIA
ELECTRONICS & TRANSFORMER CORP
Dept. PI-11, Caledonia, N.Y.

For HIGHEST ELECTRICAL & MECHANICAL Efficiency!

New JONES 2400 SERIES PLUGS & SOCKETS

Improved Socket Contacts. Four individual flexing surfaces. Positive contact over practically their entire length.

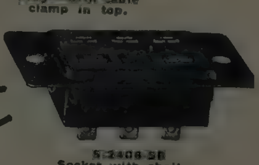
Both Plug and Socket Contacts mounted in recessed pockets greatly increasing leakage distance, INCREASING VOLTAGE RATING.

Plug and Socket Contacts cadmium plated.

Add to appearance of your equipment. Interchangeable with Jones 400 Series.

Ask for Catalog 20. Complete line Jones Plugs, Sockets, Terminal Strips.

P-2406-CCT Plug—with cable clamp in top.



S-2406-SB Socket with shallow bracket for flush mounting.

Jones

HOWARD B. JONES DIVISION
CINCH MANUFACTURING CORPORATION
CHICAGO 24, ILLINOIS
SUBSIDIARY OF UNITED-CARR FASTENER CORP.

IRE People

(Continued from page 80A)

as a project development engineer, has worked on numerous technical developments in broadcast equipment and technical developments in broadcast equipment and techniques used by the Du Mont Broadcasting Division. This included color operations of the Broadcast Division and continuous liaison with Du Mont's Research Division on color developments. Most recently he was in charge of "Electronicam" systems engineering for the Broadcast Division.

Concurrent with his activities at Du Mont, Mr. Auld served as television consultant to the Army Signal Corps and developed the first interim tactical television system for the Army.

During the Korean crisis, as a civilian employee of the Signal Corps he was technical director of the Signal Corps' mobile television system and developed the first such system used by the Army.

Prior to that he had been an engineer for radio station WHIL, Hempstead, Long Island, and with RCA Communications, Rocky Point, Long Island.

Mr. Auld is a member of the Society of Motion Picture and Television Engineers.

❖

Robert S. Butts (S'36–A'41–M'44) was promoted to the position of Assistant Chief Engineer of Melpar, Inc., recently.

ROBERT S. BUTTS

Mr. Butts received the electrical engineering degree from the University of Cincinnati in 1940. Prior to joining Melpar, he was associated with the Crosley Radio Corporation and Federal Telecommunication Laboratory. He joined Melpar in 1947, and has held a number of technical managerial positions within the organization since that time.

Robert E. Miller (A'45) was recently promoted from Section Head to Project Manager of a group of sections dealing with electronic research and development resulting in complete systems for the armed services.

ROBERT E. MILLER

Mr. Miller attended Pennsylvania State College, Northwestern University, University of Michigan, and George Washington University. Prior to joining Melpar, he was associated

(Continued on page 85A)

IRE People

(Continued from page 82A)

with several defense agencies as chief of a technical division. He also served on a technical management board and as an associate member of the acoustics-in-Air and electronic counter-measures panels of a research and development board.

❖

Louis Weinberg (M'52), research physicist in the Special Research Projects department, Weapon Systems Development Labs, has accepted an invitation to deliver a series of six post-graduate lectures in November at the University of Manchester, England.

Dr. Weinberg, who has been with Hughes Aircraft since October, 1951, will speak on "Linear Network Synthesis." His lectures will be based in part on papers he has written for the *Journal of Applied Physics* and the PROCEEDINGS OF THE IRE.

He attended Brooklyn College, graduating in 1941 as the first ranking scholar of its graduating class. He holds advanced degrees from Harvard University and Massachusetts Institute of Technology.

At Hughes, Dr. Weinberg is presently working on the logical design of a high-speed digital computer and on applications of network theory.

Section Meetings

AKRON

Remarks on IRE National Affairs and "Sanitary Radio" by John D. Ryder, President, IRE; September 20, 1955.

ATLANTA

"History and Development of the Vidicon Camera Tube" and Demonstration, by Wynne Stewart, Thompson Products Co.; September 16, 1955.

BALTIMORE

"Electronic Music Synthesizer," by Dr. H. F. Olson, RCA; September 14, 1955.

BEAUMONT-PORT ARTHUR

"F.M. Telemetering in Electrical Well Services (Oil Well)," by O. R. Smith, Halliburton Oil Well Cementing Co.; September 13, 1955.

BUENOS AIRES

"Nuclear Reactors," by Otto Gamba; June 2, 1955.

"Radio Location Systems for Hydro and Topographic Work and for Navigation Purposes," by Charles Hastings; July 7, 1955.

"Quality Control," by E. A. Machado; July 21, 1955.

"Impressions of a Tour Through U.S.A. and Europe," by P. J. Noizeux; August 4, 1955.

(Continued on page 86A)

A NEW "HI" IN QUALITY

ERIE

HI-RELIABILITY CERAMICONS®

are better than 99.99% dependable

APPLICATIONS FOR HI-RELIABILITY CERAMICONS

- Guided Missiles
- Military and Civilian Communications
- Scientific and Business Computers
- Industrial Controls
- Aviation Equipment
- Radar Equipment

ERIE has met the demands for capacitors that set new records for reliability. The new "HR" line of HI-RELIABILITY CERAMICONS has established a failure rate approximating zero—approaching only 1/100 of 1 per cent!

This "HR" Premium Line includes Temperature Compensating and Hi-K Types in both Disc and Tubular Ceramicon Styles. It has been designed for manufacturers of highly complex military and commercial electronic equipment where continuous operation is essential.

Produced of the very best material, under ideal conditions, and thoroughly tested to insure the required reliability, these Custom Designed Ceramic Capacitors offer:

- Extreme moisture resistance
- Stability maintained throughout life
- Unequalled low failure rate
- Remarkable performance at 125°C

Because these capacitors are Custom Designed and Specially Manufactured, ERIE is able to offer a wide variety of designs tailored to meet your particular reliability problem. Complete description and specifications are available in Bulletin 448. Write regarding your needs for Hi-Reliability Ceramicons.

And Now ERIE Hi-Reliability Button® Mica Capacitors

The wide acceptance of ERIE "HR" Hi-Reliability Disc and Tubular Ceramicons prompted ERIE to develop a line of Hi-Reliability Button Mica Capacitors. Erie Engineers are available to work with you on any specific Hi-Reliability program.

ERIE electronics

ERIE ELECTRONICS DIVISION
ERIE RESISTOR CORPORATION
Main Offices and Factories: ERIE, PA.
Manufacturing Subsidiaries
HOLLY SPRINGS, MISSISSIPPI – LONDON, ENGLAND – TRENTON, ONTARIO

"WOW!
I hope we
got a record
of THAT...!"

COSTLY DESTRUCTION TESTS DEMAND
THE RELIABILITY OF A

FAIRCHILD OSCILLO-RECORD CAMERA

Of course, you can always get another piece of equipment to test, set up your instruments, repair your personnel, relandscape the grounds and start all over . . . but it's really easier and less expensive to get the data the first time. Barring a cataclysm like the one above, the Fairchild Oscillo-Record Camera is your best bet for getting accurate records of the test data you want . . . the first time.

Since Fairchild built the first camera specifically designed for oscilloscope recording, more *Oscillo-Record* cameras have been used than all other continuous motion oscilloscope recording cameras combined. The *Oscillo-Record* camera has several design features which contribute to its outstanding reliability and trouble-free operation in obtaining accurate test data. It is ruggedly constructed; its sprocket film drive eliminates slippage, even at high speeds. Rigid, top-of-scope mounting safeguards it against accidental upsetting, maintains the camera in focus at all times and leaves oscilloscope controls unobstructed. Other features include the electronically-controlled continuously variable film speed which permits the selection of the exact rate of film transport for optimum performance.

For any wave pattern . . . continuously varying, stationary or single transient, at all speeds from 1 to 3600 inches per minute, (7200 in/min on special order) the Fairchild Oscillo-Record camera is the reliable means of photographing scope patterns. Industrial Camera Division, Fairchild Camera & Instrument Corp., 88-06 Van Wyck Expressway, Jamaica, L. I., N. Y., Dept. 120-25H.

FAIRCHILD

OSCILLOSCOPE RECORDING CAMERAS

Section Meetings

(Continued from page 85A)

DALLAS-FORT WORTH

"New High-Power McIntosh Amplifiers and their Circuit Features," by F. H. McIntosh, McIntosh Laboratory, Inc.; September 20, 1955.

EMPORIUM

"Bell Solar Battery," by R. G. Fithian, Bell Telephone Co. and "Nomographs in Tube Design," by R. D. Reichert, RCA; August 26, 1955.

"Magnetic Amplifiers as Components in Automatic Control Systems," by F. L. Spencer, Jr., Bendix Aviation Corp., and "Transistors and Their Applications," by W. F. Palmer, Sylvania Electric Products, Inc.; August 27, 1955.

EVANSVILLE-OWENSBORO

Tour of Southern Indiana Gas and Electric Co., conducted by Noel Baum; September 14, 1955.

HAMILTON

"Color Television Receiver Design Techniques," by David Plummer, Sylvania Electric Corp.; September 12, 1955.

HAWAII

"Development and Application of Variable Vacuum Capacitors, Vacuum Relays and Switches," by J. Jennings, Jennings Mfg. Co.; September 14, 1955.

HUNTSVILLE

Tour of P. R. Mallory Company; August 20, 1955.

INYOKERN

"Recent Advances in TR, Dual TR and Shutter Tubes," by Harold Heins, Bomac Labs.; August 18, 1955.

"Digital Displays" by Walter A. East, Electro Instruments, Inc.; September 19, 1955.

LOS ANGELES

"Air Force Thought on Missile Reliability," by C. E. McLaughlin, Wright Air Development Center; and panel and open forum on "Three Phases of Reliability": Moderator—Bernard Hecht, panelists: Dr. W. B. Pohlman, G. H. DeWitz and C. F. Goodman; September 6, 1955.

LUBBOCK

General meeting; September 8, 1955.

MIAMI

"Flying Saucers," by Norman Bean, Radio Station WTVJ; August 26, 1955.

NEW ORLEANS

"Color TV Picture Tube Principles," by Dr. C. G. Lob, General Electric Company; August 26, 1955.

PITTSBURGH

"Antenna Lore," by E. A. Laport, RCA; September 12, 1955.

SACRAMENTO

"Tools and Techniques of the Microwave Engineer," by Robert Brunner, Neely Enterprises; September 16, 1955.

SAN DIEGO

"Recent Developments in the Direct Analogy Electric Analogue Computer and Comparison with Electronic Differential Analyzer," by Dr. G. D. McCann, California Institute of Technology; June 7, 1955.

"All Media, Isotropic or not, the Electromagnetic Field of a Guided Wave is a Linear Function of the Longitudinal Component of the Hertzian Vector," by Dr. Jean Antoine Ortusi, Compagnie

(Continued on page 89A)

Section Meetings

(Continued from page 86A)

Generale de T.S.F.; July 5, 1955.

"Possibilities and Commercial Operation of Newest Electronic Computers," by Ben Ferber, Convair; August 9, 1955.

TULSA

"Electronic Design and Circuitry for a Modern Automatic Computer," by Dura Sweeny, IBM, Inc.; September 15, 1955.

TWIN CITIES

"Power Transistors—Theory and Application," by G. M. Bestler, Minneapolis-Honeywell Regulator Company; September 15, 1955.

WASHINGTON, D. C.

"Photovoltaic Solar Energy Conversion," by W. L. Doxey and Dr. H. K. Ziegler; September 12, 1955.

WINNIPEG

Tour of Early Warning Radar Installation by Major Pruil and Staff; September 9, 1955.

SUBSECTIONS

WESTCHESTER COUNTY

"Electronics in Medicine," by Martin Scheiner, Electronics for Medicine, Inc.; September 21, 1955.

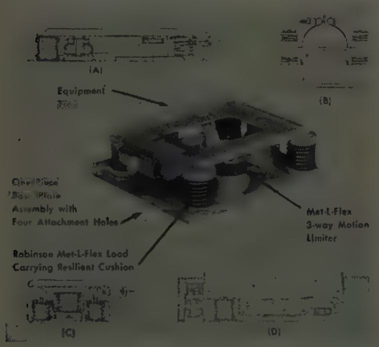
News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 36A)

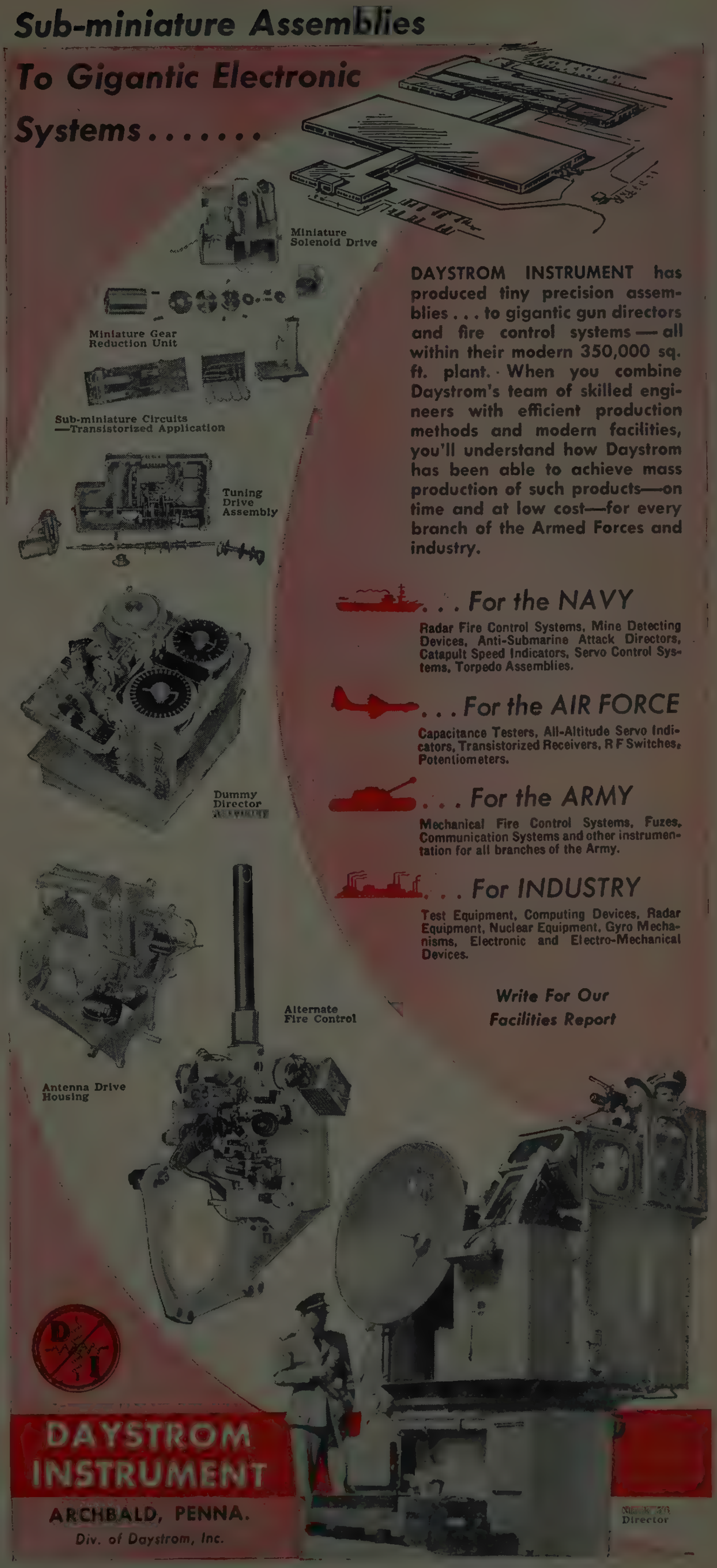
Aircraft Vibration Mounts

New all-metal mounting systems manufactured by **Robinson Aviation, Inc.**, Airborne Div., Teterboro, N. J., have proven to be an advance beyond current military specifications.


(A)
(B)
Equipment Tray
One-Piece Base Plate Assembly with Four Attachment Holes
Met-L-Flex 3-way Motion Limiter
Robinson Met-L-Flex Load Carrying Resilient Cushion
(C)
(D)

Type A is a conventional base mounting system for lighter equipment loads of a normal shape. The simplest, most basic of the four, it utilized MET-L-FLEX resilient elements in single sets (those elements surrounded by springs),

(Continued on page 90A)


Sub-miniature Assemblies
To Gigantic Electronic Systems . . . .

Miniature Solenoid Drive
Miniature Gear Reduction Unit
Sub-miniature Circuits —Transistorized Application
Tuning Drive Assembly
Dummy Director Assembly
Alternate Fire Control
Antenna Drive Housing
Director

DAYSTROM INSTRUMENT has produced tiny precision assemblies . . . to gigantic gun directors and fire control systems — all within their modern 350,000 sq. ft. plant. When you combine Daystrom's team of skilled engineers with efficient production methods and modern facilities, you'll understand how Daystrom has been able to achieve mass production of such products—on time and at low cost—for every branch of the Armed Forces and industry.

. . . For the NAVY
Radar Fire Control Systems, Mine Detecting Devices, Anti-Submarine Attack Directors, Catapult Speed Indicators, Servo Control Systems, Torpedo Assemblies.

. . . For the AIR FORCE
Capacitance Testers, All-Altitude Servo Indicators, Transistorized Receivers, R F Switches, Potentiometers.

. . . For the ARMY
Mechanical Fire Control Systems, Fuzes, Communication Systems and other instrumentation for all branches of the Army.

. . . For INDUSTRY
Test Equipment, Computing Devices, Radar Equipment, Nuclear Equipment, Gyro Mechanisms, Electronic and Electro-Mechanical Devices.

Write For Our Facilities Report

D I
DAYSTROM INSTRUMENT
ARCHBALD, PENNA.
Div. of Daystrom, Inc.

New!

AMPLITUDE MODULATOR

100% Modulation with Low Distortion

AMPLITUDE MODULATOR

MODEL 115

FEATURES:

- Provides 100% modulation with low envelope distortion.
- Produces amplitude modulation of signal with negligible accompanying incidental frequency modulation.
- Simple to operate since no special set-up adjustments are required.
- Accurate percent modulation calibration.

USES:

For making measurements on systems requiring up to 100% modulation with low distortion . . . for measurements on narrow-band receivers where incidental fm cannot be tolerated.

The Model 115 Amplitude Modulator is designed to be used with any conventional a-m or f-m signal generator or oscillator within its frequency range. It consists of an input audio amplifier, an aperiodic balanced modulator, and a monitoring vacuum-tube voltmeter calibrated in per cent modulation.

The per cent modulation is essentially independent of both the input carrier amplitude and of the carrier frequency. An audio oscillator capable of developing approximately 10 volts across 100,000 ohms provides 100% modulation. A single control on the panel sets the percent modulation to the value indicated on the panel meter.

It is particularly convenient to use the Model 115 with Measurements' Model 82 Standard Signal Generator, since this instrument provides both the carrier and the modulating source in one convenient case.

SPECIFICATIONS:

CARRIER FREQUENCY RANGE: 100 kc. to 50 mc. with a translation gain of approx. 0.1.
CARRIER INPUT AND OUTPUT IMPEDANCE: 50 ohms nominal.
MODULATION FREQUENCY RANGE: Flat within ± 5% from 30 cycles to 15 kc. Approx. 10 volts across 100,000 ohms required for 100% modulation.
AMPLITUDE MODULATION: 0 to 100% with less than 3% envelope distortion at 100% modulation, decreasing with lower modulation percentage.
MODULATION ACCURACY: ± 5% of full scale from 0 to 100%.
POWER SUPPLY: 117 volts, 50 to 60 cycles, 40 watts.

Write for Bulletin 166.

Laboratory Standards

MEASUREMENTS CORPORATION
BOONTON · NEW JERSEY

News–New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 89A)

motion limiting pads for maximum protection against over compression and a minimum compromise of space requirements.

Type B utilizes the double-acting, multi-directional Robinson fabricated stainless steel wire MET-L-FLEX cushions which have equal load carrying and shock absorption qualities in all directions, and at all angles. The mount is readily adapted to the center of gravity cradle suspension wherein the resilient members are situated so they are in the same horizontal plane as the equipment's center of gravity.

Type C is a base type of mounting for heavier loads. Double sets of MET-L-FLEX elements are for equal energy absorption in all directions (no matter what position the aircraft or missile may be in) with non-linear spring rates that assure maximum capacity for dynamic overloads which may originate from any angle.

Type D is a center of gravity modification of Type C.

All these mounting systems are engineered to each different piece of equipment. The ues of stainless steel and other durable metals gives them unchanged performance in all climates and under the most destructive conditions of exposure, vibration and shock.

Signal & Sweep Generator

The Sweepalator, a new double duty unit which will serve as a combined signal generator and sweep generator, was announced by **Decade Instrument Co.,** 14 Maple Ave., Caldwell, N. J., manufacturer of electronic test equipment.

Claimed by the manufacturer to have great accuracy, the new Sweepalator features decade

(Continued on page 92A)

① POTENT POWER +

Up to 5100 mmf at 300 vDCw

Up to 3900 mmf at 500 vDCw

② SMALL SIZE

(size) Length 3/4"
average Width 7/16"
average Thickness 3/16"
DM-20 shown actual size

El-Menco

Dur-Mica

DM-20

DIPPED MICA CAPACITOR WITH PARALLEL LEADS

③ PEAK PERFORMANCE

ideal for new miniatured designs and printed wiring circuits

MEETS ALL HUMIDITY, TEMPERATURE AND ELECTRICAL REQUIREMENTS OF MIL-C-5 Specifications!

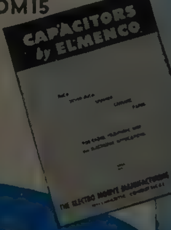
TEST IT AND COMPARE!

- El-Menco's Dur-Mica DM20 costs even less than our famous molded mica capacitors.
- Provides greater versatility — wider applications.
- Tougher phenolic casing assures *longer-life* and *greater stability* through wide ranges in temperature.
- Parallel leads simplify application in transistor and sub-miniature electronic equipment including printed circuits for military and civilian use.

For Extreme Miniaturization Use Our DM15

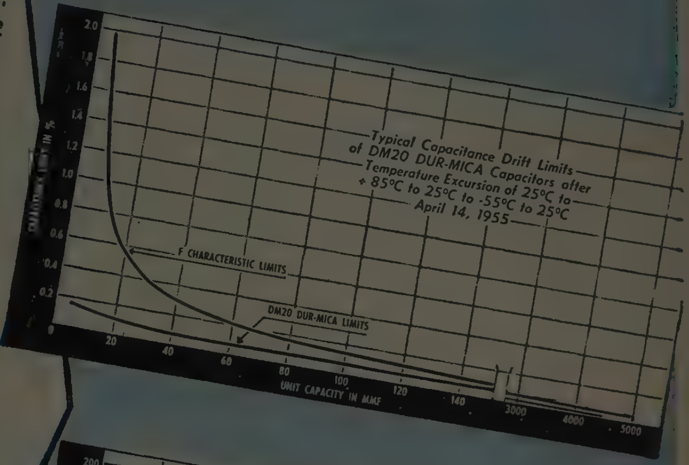
DM15 — Up to 510 mmf at 300 vDCw
Up to 400 mmf at 500 vDCw

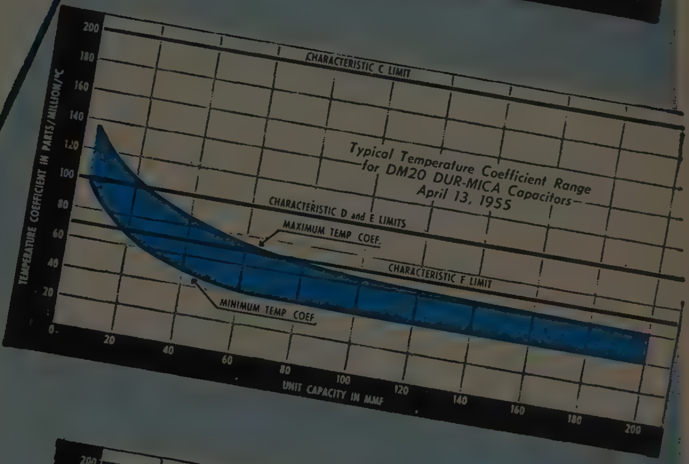
Available in 125°C operating temperature.
Minimum capacity tolerance available ±½% or 0.5 mmf (whichever is greater).

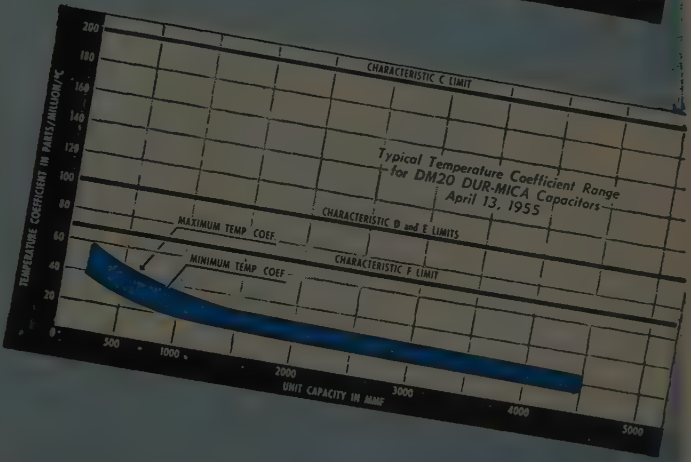


El-Menco Capacitors

to meet modern miniature requirements







For your special requirements — we are pleased to offer information and assistance. Write for free samples and catalog on your firm's letterhead.

THE ELECTRO MOTIVE MFG. CO., INC.

WILLIMANTIC CONNECTICUT

- molded mica • mica trimmer
- tubular paper • ceramic

Arco Electronics, Inc., 103 Lafayette St., New York, N. Y.
Exclusive Supplier To Jobbers and Dealers in the U.S. and Canada

DALOHM Ω ® now presents America's Finest

Collet-fitting KNOBS

Dalohm design permits positive locking on all standard shaft diameters full round or flatted with no damaging effect so frequently found when using set-screw type knobs.

FIVE SIZES ⅝″ 1 ¹⁄₁₆″ 1 ¾″ 2 ¼″ 3″

COLLETS INTERCHANGEABLE . . .
accommodate all shaft sizes from ⅛″ to ⅜″

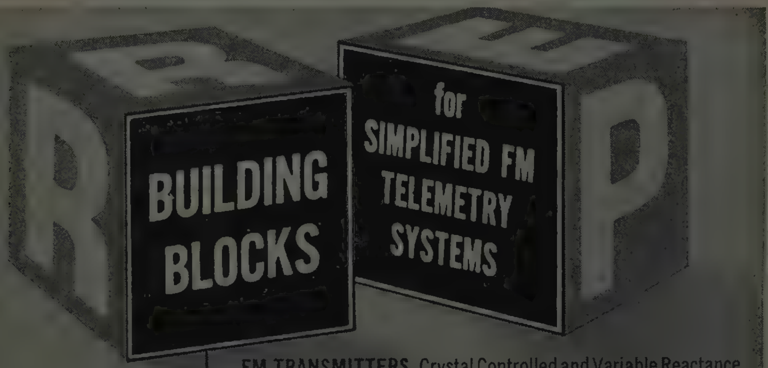
- Precision cast of thermo setting plastic in easy grip shapes. Pleasing appearance to match modern styling
- Knobs fit concentrically on shaft and can be positioned accurately and easily on full 360° radius
- Standard escutcheons, pointers and indicators available
- Highest quality at low price

Write, Wire, Call

DALE PRODUCTS, INC.

1302 28th Ave. Phone 2139
Columbus, Nebraska, U.S.A.

Ask for Bulletin K-3


R
R
E
P
BUILDING BLOCKS
for SIMPLIFIED FM TELEMETRY SYSTEMS

Assembly of these rugged building blocks into an integrated system is a simple and easy process. Analyze your telemetry requirements, sketch your block diagram, and select the required units from RREP's full line of FM transmitting equipment. You've then got the finest airborne system available.

FM TRANSMITTERS. Crystal Controlled and Variable Reactance

RF AMPLIFIERS for boosting R.F. signal strength

SUBCARRIER OSCILLATORS. Voltage Controlled, Bridge Activated, and Variable Reactance

COMMUTATORS AND DYNAMOTOR-COMMUTATOR GATING UNITS for expansion of system capacity by subcarrier commutation

UNIVERSAL MOUNTING ASSEMBLY:

UNERAC (Universal Regulator, Amplifier and Calibrator) and **UNIVERSAL MOUNTING UNITS** for mounting all RREP Oscillators

DYNAMOTORS for high voltage supplies

Technical Bulletins giving complete information on these units are available on request.

RREP

RAYMOND ROSEN ENGINEERING PRODUCTS, INC.

32nd and Walnut Streets, Philadelphia 4, Pennsylvania
Western Regional Office: 15166 Ventura Blvd.,
Sherman Oaks, Los Angeles, California

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 90A)

switching, crystal CW or center frequencies and wide range calibrated output.

Specifications include the following: Range, 10 kc to 1.5 mc; Steps, 1 kc in 3 decades; Interpolation, Calibrated 0–1 kc; Accuracy, 100 cps; Short Term Stability, ±25 cps; Harmonic Content, 3 per cent maximum; Output, 3 volts rms; Attenuator, 3, 1, 0.3, 0.1 volts full scale; Meter, Calibrated 0–1 and 0–3 volts.

For detailed information, literature and prices, write the manufacturer.

Studio Lighting Control Panel

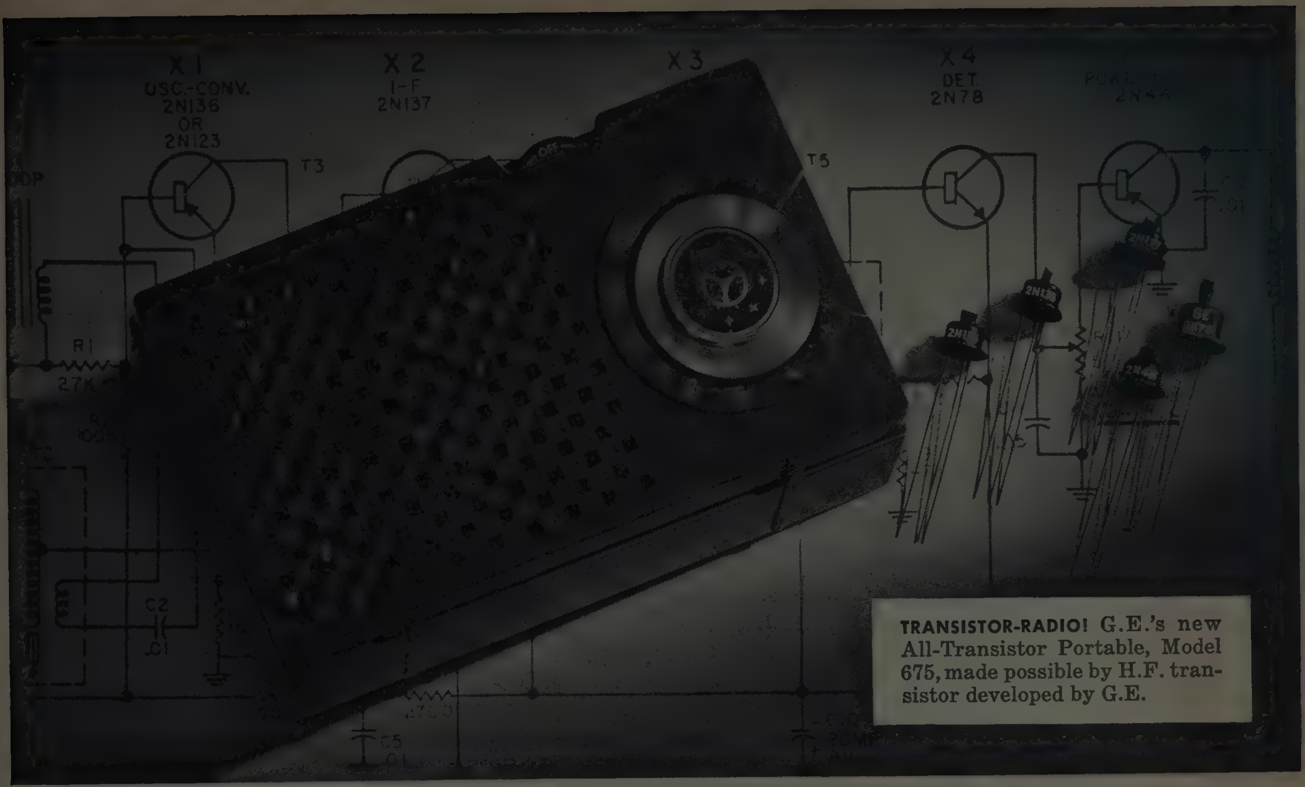
A New TV studio lighting control panel with multiple remote control has been designed by **Rust Industrial Co.,** Manchester, N. H., as a space, cost and time saver for new and expanding studios.

The panel furnishes five pre-set combinations of 40 lighting circuits from one or more control points. Five pre-set control positions each accommodate from 1 to 40 circuits. Five master control switches on the lighting panel may be paralleled with as many other remotely-located control units as desired, with a small eleven-conductor cable.

Low voltage control circuits are completely isolated from power circuits. The main unit may be flush mounted in studio or control room wall, requiring a minimum of space and high-current wiring.

The panel is designed with forty 20-ampere 120 volt circuits for use in 120/208 volt four-wire distribution systems. The cost is $1090, f.o.b. Manchester, N. H.

(Continued on page 94A)



TRANSISTOR-RADIO! G.E.'s new All-Transistor Portable, Model 675, made possible by H.F. transistor developed by G.E.

NOW—A FULL LINE OF G-E H.F. TRANSISTORS FOR ALL RADIO APPLICATIONS

New G-E H.F. PNP Transistors, 2N135, 2N136, 2N137, Complement the G-E 2N78 NPN

THIS new line of G-E High Frequency PNP Transistors offers immediate benefits to electronics manufacturers for use in RF and IF amplifier circuits. The new High Frequency designs, now in full production, were created specifically for use in radio circuits. The line provides minimum alpha cut-offs of 3 MC, 5 MC and 7 MC—coupled with a 5 ua maximum collector cut-off current. The result: all the high-gain and high-power advantages of other General Electric transistors, *plus* operating ranges extending from 3 to 15 MC depending on the transistor selected.

NOW IN COMMERCIAL RADIO CIRCUITS

In the circuit above, the 2N136 is used as a converter—its 5 MC minimum alpha cut-off assures stable oscillator performance and high conversion gain. The 2N137—with 7 MC minimum alpha cut-off—provides 33 db gain at 455 KC. The high frequency 2N135 offers a higher collector voltage rating for the second IF where it is needed. The 2N78 NPN transistor—originally designed for computer and RF circuitry—proved ideal as a power detector and audio amplifier to drive a 2N44 power output transistor with direct coupling.

PRODUCTION QUANTITIES AVAILABLE

General Electric's new high frequency line is in mass production now. Detailed characteristics and specifications of the G-E 2N135, 2N136, and 2N137 transistors may be obtained upon request. Your G-E Semiconductor specialist and our factory application engineers have the answers to your transistor radio circuit questions. Call them in, or write: *General Electric Co., Semiconductor Products, Section X52115, Electronics Park, Syracuse, N. Y.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

Build SORENSEN REGULATION into your products with these new

MAGNETIC VOLTAGE REGULATORS

CAPACITIES—15VA, 30VA, 60VA, 120VA, 250VA, 500VA.

TUBELESS—*trouble free*
COMPACT—*saves space in your equipment*
LIGHTER *than comparable regulators*
GOOD APPEARANCE—*enhances your product*
THERMALLY ISOLATED CASE—*simplifies your design problems*

ELECTRICAL SPECIFICATIONS

Input voltage range	95-130VAC, 1Ø, 60 cycles.
Output range	115VAC, RMS, 1Ø.
Regulation accuracy	±0.5% against line changes.
Load conditions	±0.5% against line at any given load from 0 to full.
Time constant	From 2 to 6 cycles for line changes.

MVR15

MVR60

MVR250

MVR30

MVR120

MVR500

GET MORE INFORMATION: Catalog MVR2 is yours for the asking; gives complete data on the new Magnetic Voltage Regulator line. Contact your local Sorensen representative, or write to General Sales Department, Sorensen & Co., Inc., 375 Fairfield Ave., Stamford, Conn.

Sorensen

CONTROLLED POWER FOR RESEARCH AND INDUSTRY

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 92A)

Time Delay Relay

A new synchronous motor driven time delay relay has been added to the line of electrical timing devices manufactured by the **R. W. Cramer Co., Inc.,** Centerbrook, Conn. Designated Type 412, it is interchangeable with its predecessor, Type 410 (or TEC). Full vision dial, approximately 300°, is protected by a transparent cover. Two pointers indicate time setting and progress. Setting mechanism provided adjustability over full dial range, even while timer is operating. A sealing-in contact permits timer operation from either momentary or sustained closure.

SECONDS
5
10
15
20
25
30
35
40
45
50
55
60
Cramer

Two SPDT and SPST open-blade contacts provide positive quick-make, quick-break operation. Contacts, rated 15 amperes at 125 volts ac, are of silver cadmium oxide with low contact resistance and ability to handle high inrush current.

Accuracy (exclusive of human setting error) is within $+\frac{1}{2}$ of 1 per cent of full scale. Repeat accuracy is within $\pm\frac{1}{4}$ of 1 per cent of full scale on timers with 30 second and longer ranges; $\pm\frac{1}{2}$ of 1 per cent on shorter range units. The timer is offered in 14 time ranges from 6 seconds through 24 hours, in 115 and 220 volts, 25, 50 and 60 cps.

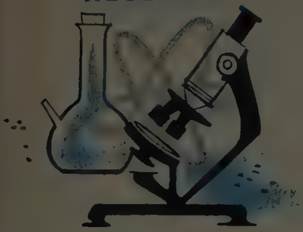
Catalog on Ceramic Capacitors

The new catalog by **Solar Mfg. Corp.,** General Sales Office, E. 46th St. and Seville Ave., Los Angeles, Calif., given application data, capacity-per-size designations, specifications and curves for

(Continued on page 96A)

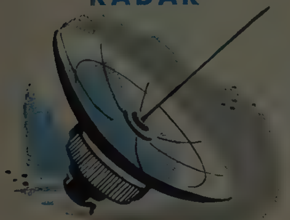
Farnsworth
In Defense and Industry

RESEARCH



Applied Physics, Circuit Research, Solid State Physics, Low Temperature Physics.

RADAR

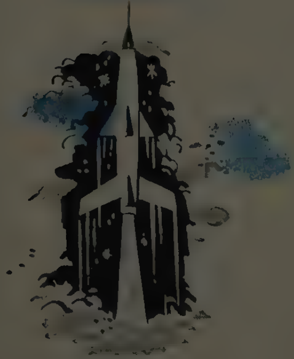


Transmitters and Receivers, Computers, Microwave Components, Pulse-Coding and Circuitry.

ELECTRON TUBES

Photomultipliers, Storage Tubes, Image Tubes, Infrared Tubes.

MISSILE

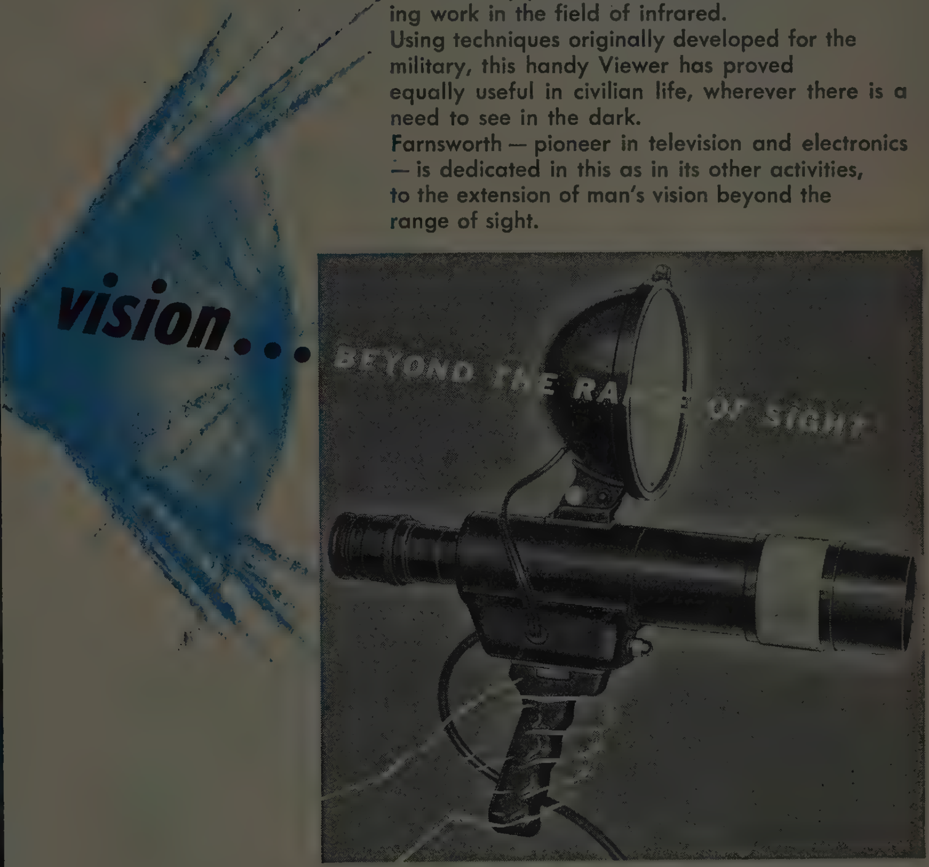


Guidance and Control System, Test Equipment.

Farnsworth
DIVISION OF IT&T

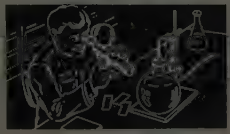
INFRARED VIEWER
Lets you see in the dark!

Another Farnsworth Achievement!
A natural by-product of Farnsworth's outstanding work in the field of infrared.
Using techniques originally developed for the military, this handy Viewer has proved equally useful in civilian life, wherever there is a need to see in the dark.
Farnsworth — pioneer in television and electronics — is dedicated in this as in its other activities, to the extension of man's vision beyond the range of sight.



MOBILE PATROL SURVEILLANCE

FILM PROCESSING INSPECTION



MEDICAL BIOLOGICAL RESEARCH

MILITARY LAND-SEA-AIR APPLICATIONS

Farnsworth
The name backed by more than a quarter century of development of television and the allied electronic arts. Pioneers in the production of special purpose tubes, in the guided missile field, in infrared, and many other electronic specialties.

For more information on the Infrared Viewer and other outstanding Farnsworth achievements write Dept. V-105.

FARNSWORTH ELECTRONICS COMPANY · *FORT WAYNE, INDIANA*
a division of International Telephone and Telegraph Corporation

DRY BY ThermoJet

★ Printed Circuits
★ Nameplates
★ Dials

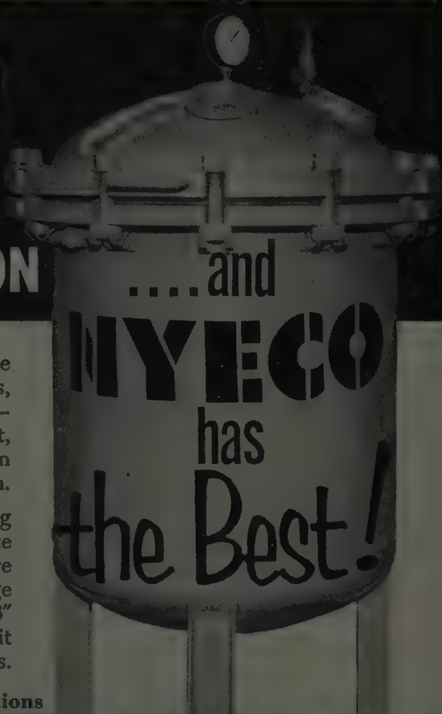
The General Thermo-Jet Dryer reduces to seconds the drying time of many inks, resists and coatings by greatly accelerating evaporation. Large quantities of warm air at high velocity are blown through a perforated metal plate directly above the work on a conveyor. This produces many tiny jets of air which rapidly blast away the solvent vapor being evaporated.

Thermo-Jet Units can be assembled to required width and length. They can be operated independently or attached to presses, coaters or other equipment. They use either electric or gas heat.
Write for complete information.

PRINT CIRCUITS BY SILK SCREEN—AUTOMATICALLY
General Decorator Presses (Series B) are specially designed for the efficient, volume production of silk screen printed electronic circuits.

GENERAL
RESEARCH AND SUPPLY COMPANY
572 S. Division Avenue
Grand Rapids 3, Michigan

BETTER IMPREGNATING EQUIPMENT MEANS BETTER PRODUCTION



Whether you impregnate electrical windings, transformers, castings, paper tubes, etc.—with NYECO's *better* equipment, you will get *better* impregnation and *more* production.

The New York Engineering Company manufactures complete systems for vacuum-pressure impregnating. Tank sizes range from 24″ diameter to 12′ 6″ diameter . . . depth to suit applications.

For prompt, reliable data and quotations

WRITE, PHONE or WIRE
NEW YORK ENGINEERING CO.
75 West Street • New York 6, N. Y. Dept. I

NYECO where progress is a habit

PHONE: WHitehall 4-5380 CABLE: NYECO, New York

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

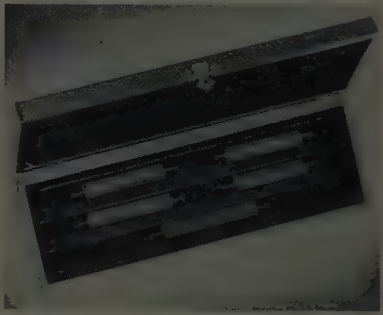
(Continued from page 94A)

a complete line of ceramic capacitors. The line includes disc types in by-pass, high voltage, temperature-compensating and special styles . . . feed-thru and trimmer types, and tubular types in by-pass and temperature-compensating styles. An extensive line of printed networks is catalogued, together with data on piezoelectric elements. Also included is a simplified style designation system for use in order.

Requests for the catalog should be sent on company letterhead.

Quartz Spring Kit

A new engineering kit containing five precision quartz springs for experimental use by engineers, chemists and physicists engaged in design and development work is announced by **Houston Technical Laboratories**, P. P. Box 6027, 2424 Branard, Houston 6, Texas.



Fabricated of fused quartz to thicknesses finer than a human hair, these helical springs are especially suitable for use in complex mechanical systems and exacting instrument applications.

Priced at $25, the kit provides an immediate selection of varying loads and sensitivities. Load maximums range from 5 gm to 50 mg, with maximum extension of 5 cm throughout. All are supplied with hook end attachments. All five units are regular stock items available in production quantities. Prompt delivery of special orders is assured.

High resistance to temperature variations an low coefficient of expansion, plus chemical stability make fused quartz suitable in applications where dimensions must be accurately maintained.

(Continued on page 99A)

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 96A)

Micrometer

An extremely accurate measuring device, capable of direct linear measurements to within one-millionth of an inch, has been developed by **Link Aviation, Inc.,** Binghamton, N. Y.

Called the Link Fringecount Micrometer, the new unit utilizes the wave length of light as a basis of measurement. As a result, gage blocks or other standards are not required for precision measurements.

The Micrometer may also be used as a precision comparator with a 2 inch range of movement from the "set" position.

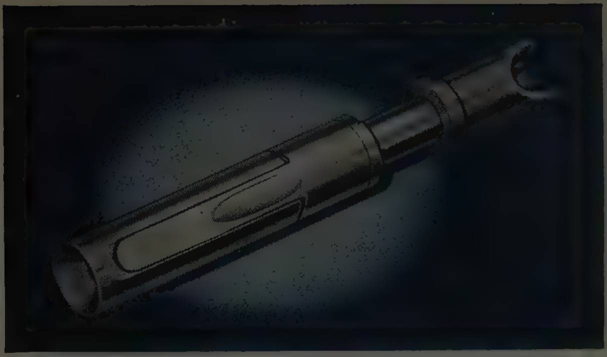
The Micrometer consists of three separate units—the measuring head, a control box and a bi-directional digital counter which displays the dimension of the part being measured.

The unit is desirable for measuring such items as gage blocks, plug gages, ball and roller bearings and precision instrument parts. In use, the unit's measuring head comes in contact with the work piece and senses its dimension. This dimension is displayed in the form of illuminated numbers on the face of the cabinet which houses the power supply and electronic digital counter.

High Voltage Capacitive Probe

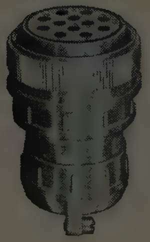
Jennings Radio Manufacturing Corp., P. O. Box 1278, San Jose, Calif., announces its Model JP-325 High Voltage Probe, which utilizes the Type VDF 2.8 Vacuum Capacitor Voltage Divider rated at 60 kv peak. The output of the divider is padded with a ceramic capacitor and is fed into three feet of RG-58 A/U cable so that the overall division ratio is 325 to 1. The input resistance is above 1012

(Continued on page 100A)



"CLIP-TYPE"
closed entry socket contact
now standard in

BENDIX
SCINFLEX
ELECTRICAL
CONNECTORS



Cannot be overstressed—eliminates intermittent circuit problems resulting from socket contact malfunction.

The heart of any electrical connector is the socket contact. This is why the Bendix-Scinflex* socket contacts have always been machined from bar stock. Stampings, with their required thin sections, can be easily overstressed.

Even with the machined sockets, industry has been plagued with overstressed spring leaves due principally to the misuse of test probes and lax tolerances on pin contacts. Bendix engineers have now provided the only socket contact on the market today which completely eliminates all these problems.

The "Clip-Type" socket will not accept any oversize probe or pin nor can one be forced into it. Also, no amount of wrenching or twisting of an acceptable pin or probe can possibly distort the spring clip. This new socket is now standard in all Scinflex connectors including those using solderless, high-temperature and thermocouple contacts.

Our sales department will be glad to furnish complete information on request.

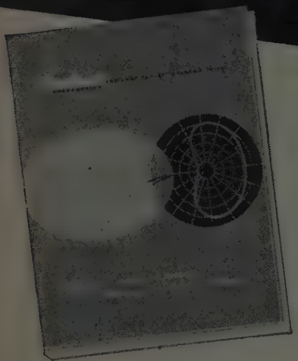
*TRADE-MARK

SCINTILLA DIVISION of Bendix
SIDNEY, NEW YORK
AVIATION CORPORATION

Export Sales: Bendix International Division, 205 E. 42nd St., New York 17, N. Y.
FACTORY BRANCH OFFICES: 117 E. Providencia Ave., Burbank, Calif. • Stephenson Bldg., 6560 Cass Ave., Detroit 2, Michigan • 512 West Ave., Jenkintown, Pa. • Brouwer Bldg., 176 W. Wisconsin Avenue, Milwaukee, Wisconsin • 8401 Cedar Springs Rd., Dallas 19, Texas • American Bldg., 4 S. Main Street, Dayton 2, Ohio • 1701 "K" Street, N. W., Washington 6, D. C. • Boeing Field, Seattle 8, Washington.

New!

Andrew
CATALOG
ANTENNAS · ANTENNA SYSTEMS
TRANSMISSION LINES



100 pages of the most complete and comprehensive data of antenna equipment and radio frequency transmission line ever published! There are 80 pages of product description and 20 pages of technical data . . . complete information for the engineer planning antenna systems. Send in the coupon below for your copy.

Get your Copy · Fill out Coupon Now!

ANDREW

ANDREW Corporation
Dept. P-11, 363 East 75th Street
Chicago 19, Illinois

Name____________________

Title____________________

Company Name____________________

Address____________________

City________Zone____State______

Our interests are in:	In this field we are:
☐ Radio communications	☐ Manufacturers
☐ Broadcast equipment	☐ Dealer or distributor
☐ Military equipment	☐ Users
☐ Other, please specify	☐ Other, please specify
__________	__________

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 99A)

ohms and the input capacitance is 4 $\mu\mu$f.

Internal resonances are above 200 mc so that the high frequency response is limited by that of the meter or oscilloscope with which this probe is used. The low frequency response is determined by the input shunt resistance of the measuring instrument with 10 megohms shunt resistance, the probe will be linear at frequencies down to 60 cps. If it is possible to operate directly into the vertical deflection plates of an oscilloscope so that the shunt resistance is above 100 megohms, then the probe frequency response is flat down to 5 cps. With this probe it is therefore possible to calibrate an oscilloscope at low freuqencies and subsequently use it at frequencies up to 50 mc with pulses as short as one microsecond without the necessity of recalibration.

Printed Circuit Boards

American Printed Circuits Co., Forrest St., P. O. Box 282, Metuchen, N. J., recently announced EPINATE (registered trade name), a completely new engineering material composed of alpha cellulose paper laminations bonded and impregnated with a modified epoxy resin. The high affinity for other materials (including metals), chemical resistance, low water absorption, physical and dimensional stability natural to epoxy chain resins make EPINATE suitable material to use where modern fabricating techniques are applied.

EPINATE paper base and glass

(Continued on page 102A)

70 mm.
for
one
millivolt
yet drift-free

TYPE M

THE OFFNER
DYNOGRAPH

0.001 volt input d-c gives 70 mm. deflection with this high-speed direct writing oscillograph, many times that for competitive units. The Dynograph with *one amplifier* is used for all types of inputs for measuring speed, temperature, position, vibration, and other variables. Patented, chopper amplifier design makes it sensitive, stable, and versatile. Available in both 6 channel console model and single and dual channel portable models. *Get bulletin L742—compare the Dynograph with all competitive models—it combines sensitivity with absolute stability.*

OFFNER
ELECTRONICS INC.
5328 N. Kedzie Avenue
Chicago 25, U.S.A.

AMERICAN TELEVISION & RADIO CO. ST. PAUL, MINN.

introduces the

new

ATR TV

Full Door Console Receiving Sets

UNSURPASSED IN BEAUTY

UNEQUALLED IN PERFORMANCE

UNMATCHED IN QUALITY CONSTRUCTION

exclusive profitable dealer franchises now available

designed with the Serviceman in mind ...easy to get at

WRITE TODAY FOR COLORFUL BROCHURE SHOWING THE NEW LINE OF ATR TV SETS

ALSO MANUFACTURERS OF DC-AC INVERTERS, "A" BATTERY ELIMINATORS, AUTO RADIO VIBRATORS

ATR AMERICAN TELEVISION & RADIO Co.
Quality Products Since 1931
SAINT PAUL 1, MINNESOTA—U.S.A.

PRACTICE MAKES *Perfect*

Consistent quality is a *must* characteristic with Bliley BH9A units.

Resonant wire supports, precision alignment, controlled soldering and plating, are the fine points that get special scrutiny, under binocular microscopes, in Bliley production. These minute details can determine performance of an otherwise perfect crystal.

Bliley BH9A units, in the frequency range 16kc to 250kc, are supplied to individual specifications as military types: CR-37, CR-38, CR-42, and CR-50.

Bliley CRYSTALS

BLILEY ELECTRIC COMPANY

UNION STATION BUILDING • ERIE, PENNSYLVANIA

Phase Measurement IN QUALITY CONTROL

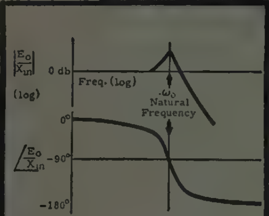
BELL AIRCRAFT USES TIC'S DIRECT READING PHASE METERS

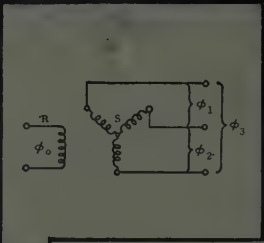
to speed production and unit inspection in the Buffalo, New York, plant.

Adjustments and performance tolerance limits are quickly and accurately established by Bell's production personnel with TIC's Phase Meters for on-the-line inspection of:

MAGNETIC MODULATOR BIAS

Operating bias in magnetic modulators accurately set with TIC's Type 320-AB Phase Meter. Modulators are in helicopter vertical height control computers.



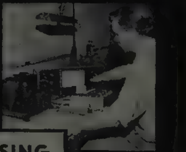


RESONANT FREQUENCY

Resonant frequency of accelerometers measured with TIC's Type 322-A Phase Meter. Meter locates frequency that produces 90° phase shift between electrical output and mechanical input. Steepness of phase curve at resonance, makes this method much more accurate than determining frequency yielding highest output amplitude.

INITIAL SYNCHRO PHASE SHIFT

Inherent phase shift between rotor and stator winding of synchros must be determined and held rigorously within small tolerances. Phase shift is displayed on TIC Type 320-AB Phase Meter.



AUTOPILOT AMPLIFIERS

Autopilot amplifier phase shift measured and adjusted to exacting tolerances with TIC's Type 320-AB Phase Meter. Amplifiers control helicopter roll, pitch, yaw and vertical height.

SYNCHRO PHASING

Helicopter Autopilot Gyro Table Assembly undergoes precise synchro phasing and connection identification. Assembly is quickly checked on a calibrated positional test table with 320-AB Phase Meter.

TIC'S PHASE METERS

DIRECT READING TIC Phase Meters permit production-line testing of vital phase characteristics. Phase meters can be used for sine wave or for complex wave inputs having one positive going zero-axis crossing per cycle. Write for free brochure 1-104 for data on TIC's complete line of phase instruments.

TECHNOLOGY INSTRUMENT CORP.

535 Main Street, Acton, Mass. COlonial 3-7711
West Coast Plant — Box 3941, No. Hollywood, Calif. POplar 5-8620

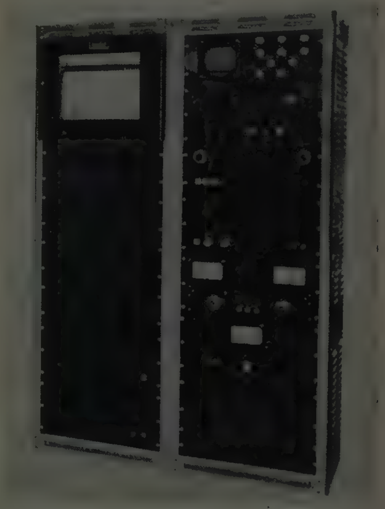
These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 100A)

cloth are available copper clad, one, two and three ounce, one or both sides. Sizes of the sheets are presently limited to 18×18 inches but larger sizes are available this fall. Thicknesses can vary from 8 mils to one half inch and very close tolerances can be observed. The coefficient of expansion of the epoxies closely parallels that of copper.

Pulse Height Analyzers

Two pulse height analyzers, Model 3300 and Model 3301, of 100 and 256 channels counting capacity, using magnetic core memory circuits, are now available from the **Radiation Instrument Development Laboratory,** 2337 W. 67 St., Chicago 36, Ill.



Rates of accumulation and data may exceed one million counts per minute. Data accumulation is in the decimal mode, and permanent readout is by decimal printer and/or precision linear graphical form by means of a Brown recording potentiometer.

Several different modes of operation of the analyzer are available, e.g., in coincidence with the output of a separate single channel analyzer, or with a "window" effect to permit placement of all the channels into any region of the complete spectrum, and others.

Channel widths are entirely free from the drifts encountered with conventional analyzers. Overall linearity is .2%.

(Continued on page 106A)

PROCEEDINGS OF THE IRE

Published Monthly by

The Institute of Radio Engineers, Inc.

VOLUME 43 *November, 1955* NUMBER 11, PT. I

BOARD OF DIRECTORS, 1955
J. D. Ryder, *President*
Franz Tank, *Vice-President*
W. R. G. Baker, *Treasurer*
Haradan Pratt, *Secretary*
John R. Pierce, *Editor*
J. W. McRae, *Senior Past President*
W. R. Hewlett, *Junior Past President*

1955
S. L. Bailey
A. N. Goldsmith
A. V. Loughren
C. J. Marshall (R5)
L. E. Packard (R1)
J. M. Pettit (R7)
B. E. Shackelford
C. H. Vollum
H. W. Wells (R3)

1955–1956
E. M. Boone (R4)
J. N. Dyer (R2)
J. T. Henderson (R8)
A. G. Jensen
George Rappaport
D. J. Tucker (R6)

1955–1957
J. F. Byrne
Ernst Weber

●

George W. Bailey,
Executive Secretary

●

John B. Buckley, *Chief Accountant*
Laurence G. Cumming,
Technical Secretary
Evelyn Davis, *Assistant to the Executive Secretary*
Emily Sirjane, *Office Manager*

EDITORIAL DEPARTMENT
Alfred N. Goldsmith,
Editor Emeritus
John R. Pierce, *Editor*
E. K. Gannett,
Managing Editor
Marita D. Sands,
Production Manager

ADVERTISING DEPARTMENT
William C. Copp,
Advertising Manager
Lillian Petranek,
Assistant Advertising Manager

EDITORIAL BOARD
John R. Pierce, *Chairman*
D. G. Fink
E. K. Gannett
T. A. Hunter
W. R. Hewlett
J. A. Stratton
W. N. Tuttle

Responsibility for the contents of papers published in the PROCEEDINGS of the IRE rests upon the authors. Statements made in papers are not binding on the IRE or its members.

Change of address (with 15 days advance notice) and letters regarding subscriptions and payments should be mailed to the Secretary of the IRE, 1 East 79 Street, New York 21, N. Y.

All rights of publication, including foreign language translations are reserved by the IRE. Abstracts of papers with mention of their source may be printed. Requests for republication

CONTENTS

Theodore A. Hunter, Director, 1955 1572
The IRE Student Quarterly .... *The Editor* 1573
5543. The ABC's of Color Television .... *J. M. Barstow* 1574
Correction to "The Design of Stagger-Tuned Double-Tuned Amplifiers for Arbitrarily Large Bandwidth," by *M. M. McWhorter* and *T. M. Pettit* 1579
5544. Electronically-Controlled Audio Filters .... *L. O. Dolanský* 1580
5545. Magnetic Fields in Small Ferrite Bodies with Applications to Microwave Cavities Containing Such Bodies .... *A. D. Berk and B. A. Lengyel* 1587
5546. On the Principle and Design of a Trigger Circuit of a Signal-Seeking Radio Using "Difference-Voltage" .... *Chih Chi Hsu* 1591
5547. IRE Standards, Graphical and Letter Symbols: Feedback Control Systems, 1955 1608
5548. IRE Standards on Pulses: Methods of Measurement of Pulse Quantities, 1955 1610
5549. The Cascade Backward-Wave Amplifier: A High-Gain Voltage-Tuned Filter for Microwaves .... *M. R. Currie and J. R. Whinnery* 1617
5550. Junction Transistor Blocking Oscillators .... *J. G. Linvill and R. H. Mattson* 1632
5551. Theory of Shot Noise in Junction Diodes, Junction Transistors .... *A. van der Ziel* 1639
5552. Multiple Frequency Shift Teletype Systems .... *D. B. Jordan, H. Greenberg, E. E. Eldredge, and W. Serniuk* 1647
5553. The Use of a Ring Array as a Skip Range Antenna .... *J. D. Tillman, W. T. Patton, C. E. Blakely, and F. V. Schultz* 1655
5554. Microwave High-Speed Continuous Phase Shifter .... *W. Sichak and D. J. Levine* 1661
5555. A Comparison of Two Radiometer Circuits .... *S. J. Goldstein* 1663

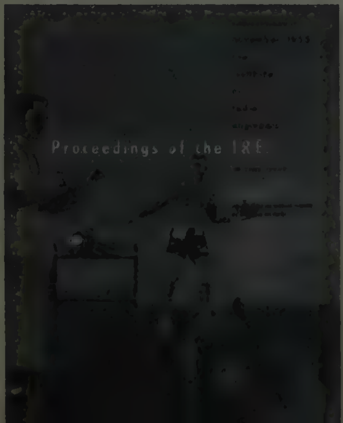
Correspondence:

5556. Optimizing the Design Characteristics of Triodes for Maximum Gain into a Fixed Load Impedance .... *M. Bareiss* 1667
5557. Influence of the Order of Overtone on the Temperature Coefficient of Frequency of AT-Type Quartz Resonators .... *R. Bechmann* 1667
5558. Optimum Tube Utilization in Cascaded Distributed Amplifiers .... *A. I. Talkin and J. V. Cuneo* 1668
5559. Self-Bias Cutoff Effect in Power Transistors .... *N. H. Fletcher* 1669
5560. A Note on the Transfer Voltage Ratio of Resistive Networks with Positive Elements .... *R. J. Schwarz* 1670
5561. Two Problems in Geometrical Optics and Application of the Results in Electron Trajectory Calculations .... *S. V. Yadavalli* 1670
Contributors 1672

IRE News and Radio Notes:

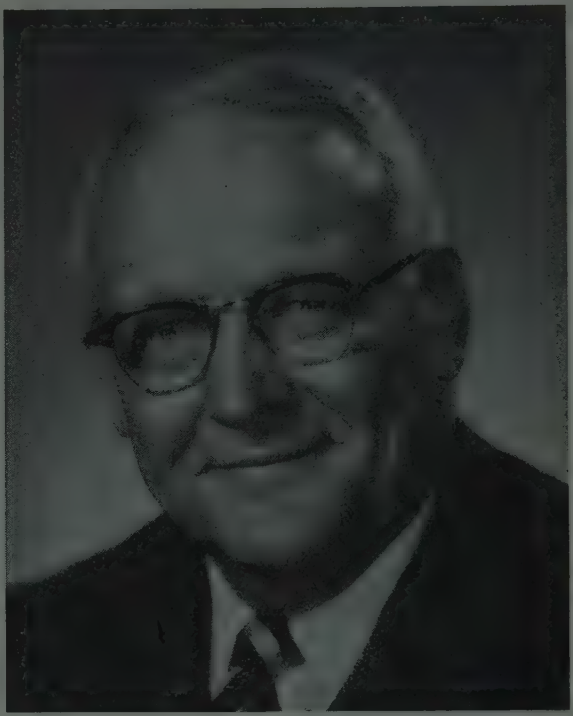
IRE Presents 1956 Awards 1675
Professional Group News 1676
Technical Committee Notes 1677
5562–5569. Books 1677
Professional Groups 1680
Sections 1680
5570. Abstracts of IRE Transactions 1683
5571. Abstracts and References 1684

Meetings with Exhibits 6A
News and New Products 34A
Industrial Engineering Notes 38A
Membership 53A
IRE People 70A
Section Meetings 85A
Positions Wanted 152A
Positions Open 175A



Cover—A newly developed miniature transmitter comprised of two units, each no larger than a package of cigarettes, demonstrates its use in one of several fields, medical electronics. Diagnostic tests such as the simultaneous transmission of heart sounds and electrocardiograph voltages may be performed on ambulatory subjects. It is now possible to make cardiac examinations while a patient performs normal activities. Numerous other applications to medical electronics are possible, such as blood pressure, respiratory, and brain wave measurements.

Photo—Jansky and Bailey, Inc.
Washington, D.C.



Theodore A. Hunter

DIRECTOR, 1955

Theodore A. Hunter was born December 5, 1900, in Dike, Iowa. He received the B.S. degree in electrical engineering from the State University of Iowa in 1922. In 1923, the university awarded him the M.S. in physics and in 1933, the E.E.

Mr. Hunter joined the North West Bell Telephone Company as a transmission line inspector. Following that, he was an instructor in physics at the University of Pittsburgh. He then joined Crosley Radio Corporation as supervisor of loud speaker development. From 1931, he served as a physics instructor at Rose Polytechnic Institute. In 1940, Mr. Hunter became associated with Collins Radio Company as director of oscillator development. The Collins 32V-1, Collins Oscillator Series 70E-1 to 9, and the 310-B exciter unit were developed by Mr. Hunter. At present, he is Professor of Research in the Psychology Department at the State University of Iowa as well as President of the Hunter Manufacturing Company.

Mr. Hunter organized the Cedar Rapids Engineering Club and has served as President and Program Chairman of the group. He also has been President and Program Chairman of the Collins Radio Technical Society, another group which he organized. He is a member of the Iowa Engineering Society and Sigma Xi.

Mr. Hunter was a Charter Member of the Cincinnati Section and co-organizer of the Cedar Rapids Section. He was General Chairman of the first Cedar Rapids Communication Conference and has been on the Executive Committee of the Cedar Rapids Section for eight years. Mr. Hunter was the first Regional Director for Region Five. He has served on many committees, including Sections, Papers, Policy Advisory, and Nominations, of which he was chairman from 1949 to 1951.

Mr. Hunter joined the IRE as an Associate in 1928; he became a Member in 1941, Senior Member in 1943, and a Fellow in 1947. He is now serving on the Education Committee and devotes himself to editing the newly created *Student Quarterly*.

The IRE Student Quarterly

The IRE has a student quarterly publication because Ted Hunter realized that the students needed one, and that it was in the interests of the IRE to supply it. In 1953, with the help of friends and students, he got out a sample issue himself. He sold the idea to the IRE. Starting September of last year, every Student Member has received a free copy of each issue.

The IRE has a good student quarterly because Ted Hunter understands students. Having true understanding, he questions it and refreshes it himself. He is advised and supported by an excellent Student Quarterly Committee, which includes students among its members. In January and February 1955 he made a three-week tour, during which he visited eleven Student Branches to see what students and faculty members thought of *The Quarterly*. Ted also understands the professional world students enter after leaving college, and he understands the IRE. He likes them all.

The Student Quarterly tells and reassures the students about the experiences in a first engineering job in words they can understand—the words of men a few months out of college. It tells students about the opportunities in various fields of engineering. It tells the students about the various Professional Groups (a Student Member may belong to one Professional Group for a dollar a year). It contains understandable technical articles which members of the faculty can assign as course work if the students fail to read them voluntarily (is this treason?). It contains real humor with a real point, in the characters, actions, and appearances of Professor Floop, who, when at the board, erases notes faster than the students can copy them; A. G. Goodfellow, whom we all revere; and Beamie (see Proc. IRE, vol. 43, p. 380; March, 1955), who is always on the student's side.

Although *The Student Quarterly* is designed primarily for students, I myself enjoy reading it a lot, and I think that other IRE members would, too. They can subscribe for two dollars a year. A paper reprinted in this issue of the Proceedings, "The ABC's of Color Television" by J. M. Barstow, is a sample of just one sort of thing to be found in *The Student Quarterly*. The contents are varied, sound, sensible, and never stuffy. There is no nonsense about Ted Hunter. When he speaks, he talks about real problems. His humor is never old, inappropriate jokes dragged in by the heels for the sake of a laugh. He tries to make his authors live up to these principles, and he succeeds pretty well in doing so.

Publications take work. *The Student Quarterly* takes a lot of work. IRE members are used to writing learned papers for the Proceedings, but they aren't yet accustomed to writing for *The Student Quarterly*. Ted Hunter needs the help of the membership in getting good articles. He wants good technical articles by students. He wants good articles by students who have gone into industry recently, telling what they have learned out of college and what they wish they had learned before leaving. But he needs articles by more mature and experienced engineers as well. Do you have something to say about your particular field of work, something you think would interest and help students? Do you have some reflections about professional life which are really wisdom and not prejudice? Do you know about some fresh technical matter which you think would interest students and help them to understand something important? Get in touch with Ted Hunter, 1164 East Court Street, Iowa City, Iowa. Student Member or Fellow, you will find him appreciative, helpful, and a severe and honest critic. If you write an article acceptable to him, you can be pretty sure that you will be helping the students or at least making them think. If he finds what you have written unacceptable, whether you are a Student Member or a Fellow you can be pretty sure that it is because someone else had something more suitable to say, or has said it better.

—*The Editor*

The ABC's of Color Television*

J. M. BARSTOW†, SENIOR MEMBER, IRE

TELEVISION PROGRAMS in color are now being produced regularly by major broadcasting companies, and the corresponding signals are being transmitted over both the local and intercity facilities of the Bell System to color TV transmitters. Although much publicity has been given to the advent of this rather astonishing new development, most of the articles have been either highly technical or intended for the newspapers. They have not provided an understanding of the system for intelligent engineers who are not able to devote sufficient time to the subject to master the more obscure technical details. This article is intended to fill a need felt in many quarters to answer a number of questions which have arisen concerning the generation of the signals and the manner in which they are used to produce a color picture.

It will be assumed that the reader has some knowledge of how a black-and-white TV picture signal is generated and displayed; *i.e.*, the picture is "painted" on the TV tube by the modulated intensity of a spot which is swept repeatedly across the face of the tube from left to right, each sweep taking about 1/15,750 second, the spot descending gradually from top to bottom of the tube in about 1/60 of a second. This cycle of events occurs over and over again, giving rise to the illusion of continuous motion in any televised scene.

With this background in mind, curious engineers generally have several simple questions in mind when they are told that by a modified, but compatible, system, a color picture can be painted on the tube face. Some of these questions are: (1) how does the system work in simple terms? (2) how is color (hue) produced on the picture tube of a color receiver? (3) how can color TV signals and monochrome TV signals be "compatible"; *i.e.*, what does a monochrome receiver do with the color information signals (which it does not need and cannot use), and how can a color receiver do without color information? In an attempt to answer these questions in easily understandable terms, a description will be given in the following paragraphs and associated figures of the general plan employed, without going into details as to how the plan is carried out.

COLORIMETRY AND THE COLOR PICTURE TUBE

A few rudimentary principles of colorimetry must first be understood; *i.e.*, those having to do with the reaction of human vision to lights of differing color. The necessary principles may best be understood by describing an experiment with colored lights. Suppose, for example, in a darkened room, a white reflecting surface is illuminated in three different spots with light from three different projection lanterns. In the path of the light from one lantern, a filter will be placed which will allow green light to pass through, but no other color. Similarly, in the paths of the beams from the other lanterns, red and blue filters will be placed respectively, so that to an observer with good color vision, the spots will appear to be green, red, and blue. Now suppose the projection lanterns are oriented so that the three spots partially merge. The area on which all three lights fall simultaneously will appear white. The area on which green and red light falls will appear yellow; the area on which red and blue light falls will appear as lavender or magenta, and the area on which the blue and green light falls will appear blue-green or cyan. These results are shown on Fig. 1 (see color insert following p. 1578) and the results of the experiment illustrate the additive properties of colors (not to be confused with the subtractive properties of color when different color pigments are mixed).

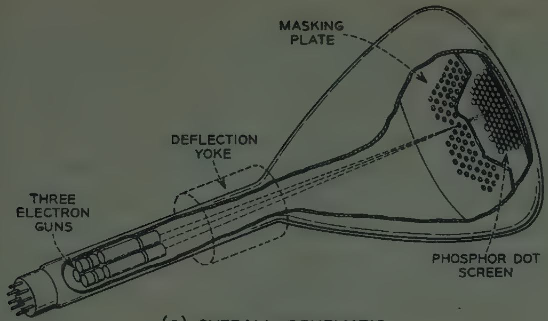
The additive properties of colored lights are employed in color television. When the eye can see separate areas (*i.e.*, areas large enough to be resolved by human vision) illuminated by different colored lights, it will recognize the different colors, but when the colors merge, or the areas become so small and so close together that the eye sees them as if they were in the same place, the individual colors no longer are recognized. In the experiment described above, if the dots were each reduced in size to about that of a pinhead, and then so located on the white surface that they did not merge but were tangent to each other, the area which they effectively cover would appear white from a distance of about 15 feet. At a distance of a few inches, the three separate colors would be recognized.

The structure of a color television picture tube is shown in Fig. 2 (opposite). Phosphor plate of tube is a glass screen covered with about 1,070,000 phosphor dots (21″ tube), one-third of which will glow green under the influence of a beam of electrons, one-third, red and one-third, blue. The dots are placed on the phosphor plate of the tube in clusters of three: one green, one red, and one blue, so that there are about 350,000 clusters of three dots each, uniformly distributed over the active area of the tube. The neck of the tube contains three electron guns, the first, for emitting a beam intended for the green glowing dots, the second, for emitting a beam for the red glowing dots, and the third, a beam for the blue glowing dots. Between the electron guns and the phosphor plate, but only about one-half inch from the phosphor, is a masking plate which has 350,000 small holes in it, each hole being placed approximately over the center of a cluster of three phosphor dots. Under the influence of focusing coils and magnets,

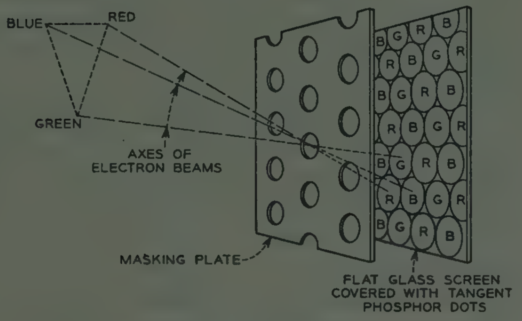
---

* Original manuscript received by the IRE July 9, 1955.

† Bell Telephone Labs., New York, N. Y.


MASKING PLATE
DEFLECTION YOKE
THREE ELECTRON GUNS
PHOSPHOR DOT SCREEN

(a) OVERALL SCHEMATIC


BLUE
RED
GREEN
AXES OF ELECTRON BEAMS
MASKING PLATE
FLAT GLASS SCREEN COVERED WITH TANGENT PHOSPHOR DOTS
B
G
R

(b) ENLARGED SECTION SHOWING GEOMETRICAL RELATIONS

Fig. 2—Structure of tri-colored television tube: (a) over-all schematic; (b) enlarged section showing geometrical arrangement. (Courtesy of RCA.)

the three beams from the three guns are made to converge at the masking plate, and hence, they diverge slightly beyond the masking plate. This slight divergence is sufficient so that the beam from the green gun strikes only the green glowing dots and similarly, the beams from the red and blue guns strike only the red and blue glowing dots, respectively. A cluster of three phosphor dots is so small that one dot cannot be resolved from another at distances greater than a few feet. Therefore, at distances of four times picture height or greater, a wide range of colors can be produced (including white) by controlling the magnitudes of the beams from the three guns. The apparent sharpness of the picture is reduced very little. When the beams from the three guns are strong, and correctly proportioned in magnitude, white is produced. If they remain in the same proportions, but are gradually reduced in magnitude to near zero, the white is correspondingly reduced in intensity through shades of gray to black. If the beam from the green gun is strong and the others near zero, the color produced is green (the red and blue glowing dots do not glow). Similarly, any color can be produced that is within the range of colors that can be synthesized from green, red and blue. This range embraces nearly all those seen in nature or employed by human beings for decorative purposes.

As the tube is scanned from left to right and from top to bottom by the three beams in unison, the convergence of the beams at the masking plate is maintained within close limits.

The remaining features of the system are concerned with the production and transmission over one 4.2-mc circuit of the signals applied to the three guns of the picture tube.

Color Signal Generation

Color signals are generated in a manner shown in Fig. 3 below. Three cameras are used effectively with light filters so that the ouptut of one camera is due to the green light obtained from the object being televised,

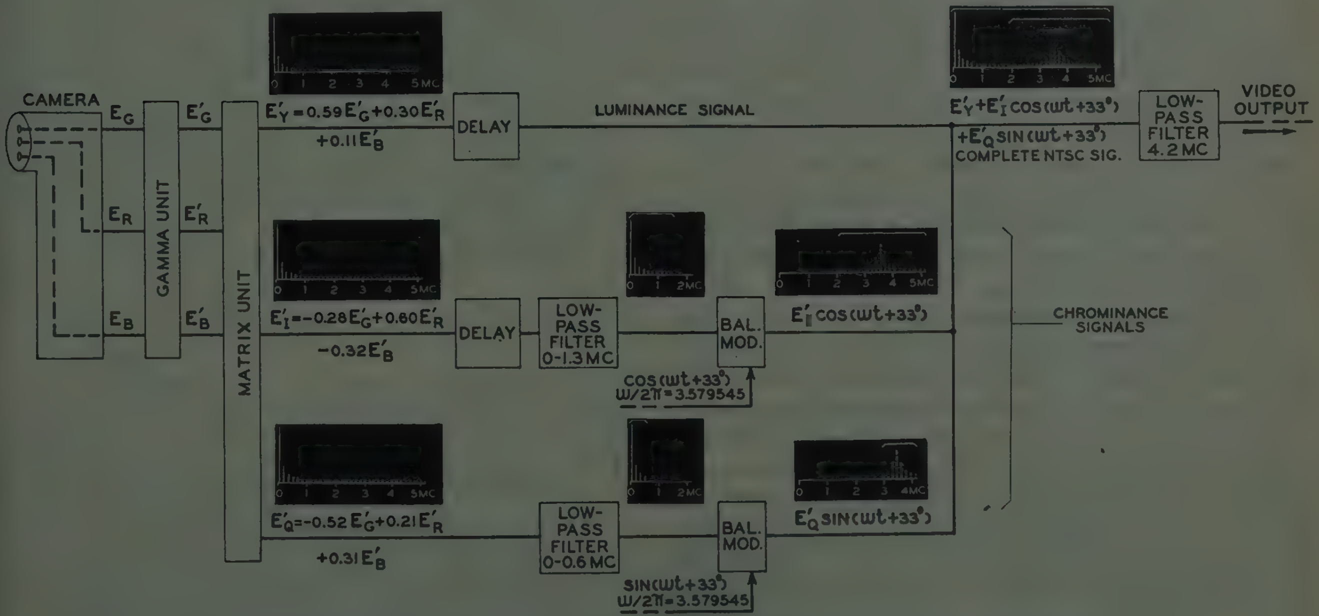

CAMERA
E_G
E_R
E_B
GAMMA UNIT
E'_G
E'_R
E'_B
MATRIX UNIT
0 1 2 3 4 5MC
$E'_Y=0.59E'_G+0.30E'_R$ $+0.11E'_B$
DELAY
LUMINANCE SIGNAL
0 1 2 3 4 5MC
$E'_Y+E'_I\cos(\omega t+33^\circ)$ $+E'_Q\sin(\omega t+33^\circ)$
COMPLETE NTSC SIG.
LOW-PASS FILTER 4.2 MC
VIDEO OUTPUT
0 1 2 3 4 5MC
$E'_I=-0.28E'_G+0.60E'_R$ $-0.32E'_B$
DELAY
0 1 2MC
LOW-PASS FILTER 0-1.3MC
BAL. MOD.
$\cos(\omega t+33^\circ)$ $\omega/2\pi=3.579545$
0 1 2 3 4 5MC
$E'_I\cos(\omega t+33^\circ)$
CHROMINANCE SIGNALS
0 1 2 3 4 5MC
$E'_Q=-0.52E'_G+0.21E'_R$ $+0.31E'_B$
0 1 2MC
LOW-PASS FILTER 0-0.6 MC
BAL. MOD.
$\sin(\omega t+33^\circ)$ $\omega/2\pi=3.579545$
0 1 2 3 4MC
$E'_Q\sin(\omega t+33^\circ)$

Fig. 3—Schematic of equipment component functions for generating NTSC color video signals.

the output of the second, due to red light, and that of the third, due to blue light. The horizontal and vertical sweep voltages and associated pulses are provided by the camera equipment which converts the light signal to electrical potentials E_{Red}, E_{Green} and E_{Blue}. The gamma unit contains a set of nonlinear amplifiers through which the electrical signals are passed. The unit is used at the early stage of signal generation to anticipate and correct for a characteristic of picture tubes used in receiving sets. The light output of a phosphor in a picture tube is directly proportional to the beam current striking it, but the beam current is proportional to about the 2.2 power of the voltage applied to the picture tube grid. Hence, in the gamma unit, the nonlinear amplifiers whose outputs are proportional to approximately the 1/2.2 power of the inputs, are correct for the opposite kind of nonlinearity in the picture tube. Between the outputs of the gamma unit and the picture tube grids, the system is intended to be linear.

The three outputs of the gamma unit are usually adjusted to be equal when a white area is being televised. They are then fed into a matrix unit which derives three signals: one to be used as a brightness or luminance signal similar in every respect to a monochrome signal, and the other two to be used as color information signals. In Fig. 3, the brightness signal is labeled E_y', and is formed by adding .59 of the green signal, .3 of the red signal, and .11 of the blue signal. These fractions of the individual color signals are combined because it has been determined subjectively that the three colors contribute to the total brightness of a scene in these proportions. The brightness of a given area in a televised scene corresponds to the "lightness" of the area, or the inverse of the "darkness" of the area, irrespective of "hue."

The two color information signals are formed as indicated on the figure. These signals are going to be used to modulate two single frequencies (color subcarriers) which are identical except for a 90 degree phase difference. Therefore, the proportions of each color output used are selected so that, if the different hues are considered as located along a circle, as indicated in Fig. 4, (see color insert following p. 1578) their projections on E'_i and E'_Q axes will result in the correct magnitudes of modulating voltages. Before projecting the primary color voltages onto the E'_i (in phase) and E'_Q (quadrature phase) axes, two other magnitude adjustments are made. One governs the relative magnitude of chrominance and luminance signals, and the other adjusts the three primary color magnitudes so that when a white or gray area is televised (corresponding to equal gamma corrected color voltage outputs in each of the three colors), the color voltages projected onto the E'_i and E'_Q axes will sum to zero. Hence, the modulators will have zero output. These two adjustments in the color signal voltage magnitudes produce levels of $E'_G = .593$, $E'_R = .632$, and $E'_B = .447$ before projection on the E'_i and E'_Q axes. When these color voltages are projected onto the E'_i and E'_Q axes, the results are as shown on Fig. 3. It will be noticed in this figure that the coefficients of the color voltages sum algebraically to zero, indicating that when the original gamma corrected output color voltages are equal, both the E'_i and E'_Q modulating voltages reduce to zero. It is obvious from the signs of the coefficients of the color signals emerging from the matrix unit that this unit must contain phase inverters as well as attenuators, amplifiers, and mixing circuits.

Fig. 4 shows the magnitudes and the angles of both the primary colors-red, blue and green, and the complementary colors-yellow, cyan, and magenta. The magnitudes and angles of the complementary colors are the vector resultants of the adjacent primary colors; *i.e.*, yellow .447 at 167 degrees is the vector resultant of red and green; similarly, cyan is the resultant of green and blue, and magenta resultant of blue and red.

The two modulated subcarrier outputs are combined as indicated in Fig. 3. Since each output consists of an amplitude-modulated color subcarrier, the combination will also be an amplitude-modulated color subcarrier. Since the two components differ in phase by 90 degrees, their vector sum will have an angle which is determined by the relative magnitudes of each component and thus will be phase modulated also. It should be noted that each component output may have reversed phase, (*i.e.*, 180 degrees from normal), as when the modulating voltage changes sign from positive to negative. The arrangement, therefore, provides that the color information is contained in an amplitude-modulated subcarrier whose angle, referred to an arbitrary reference, may have any value from 0 to 360 degrees.

The color signal is then combined with the luminance signal as shown schematically in Fig. 3. Since the color subcarrier has been chosen to be an odd multiple of half-line frequency (455×half-line frequency), the color signal interleaves with the luminance signal as shown in the small bandwidth illustration near the line schematically representing the output signal. This is the video signal which is transmitted. A somewhat more-detailed illustration is given in Fig. 5. The solid vertical lines indicating frequency components comprise the luminance signal, and the dotted lines, the chrominance signal. Only one-tenth of the number of components

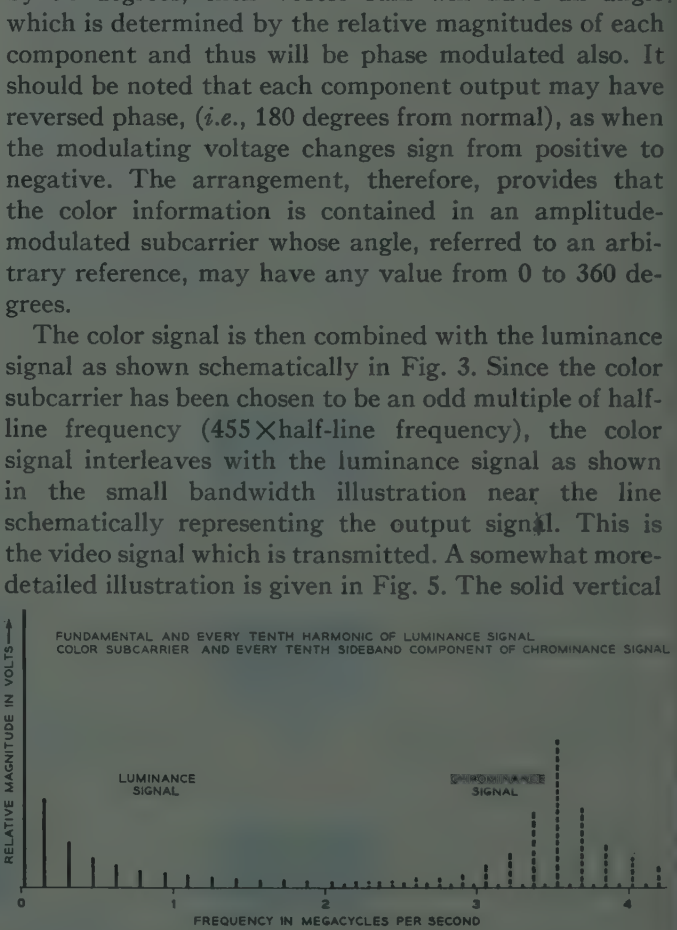


Fig. 5—Frequency composition of typical NTSC color TV signal.

are plotted for clarity of illustration. In this signal, the components of the luminance signal are separated by line frequency, (approximately 15.75 kc), as are those of the chrominance signal. It should be remembered that the luminance signals are present at all times during the transmission of a picture, although the levels of the higher frequency components vary considerably, depending on picture content. On the other hand, the chrominance components will disappear entirely when black and white objects are being televised.

Fig. 6(a) (see color insert following p. 1578) shows a color bar pattern as it would appear on the screen of a color television set and Fig. 6(b) shows the corresponding video signal waveform in one-line interval. The scale at the left of Fig. 6(b) may be considered as a video voltage scale in one-hundredth volt units. The first negative pulse is the line-synchronizing pulse which is used to send the three converging color beams back to the left side of the raster. The next short burst, at a low-voltage level corresponding to black, or at least a dark level, is the color subcarrier synchronizing burst, and is used to control the frequency and phase of the demodulating oscillator in the receiver. The phase of this burst is always 180 degrees away from reference phase, as indicated on Fig. 4. The next burst of frequencies corresponds to fully saturated green, having a peak-to-peak amplitude of $2\times.593=1.186$ and an axis level equal to green brightness or .59 (brightness indicated by light dotted lines). The next burst corresponds to saturated yellow and has a peak-to-peak amplitude of twice the resultant of maximum red and green (see Fig. 4), or $2\times.447=.894$ with an axis level equal to yellow brightness (green brightness plus red brightness), or $.59+.30=.89$. The next burst corresponds to saturated red with an amplitude of $2\times.632$ or 1.264, with an axis level at red brightness or .30. The other bursts and the corresponding colors can be seen and the amplitudes and levels of axes computed in a like manner. The factor of 2 in all these computations is used to obtain the peak-to-peak magnitudes from zero-to-peak magnitudes commonly used in electrical engineering as an expression for the maximum amplitude of a sinusoidal wave form.

The phases of the different groups of waves correspond to those shown in Fig. 4, although this cannot be well illustrated in the figure.

In review of what is shown on Fig. 6, three principles should be stated:

1. Level of zero axis of a group of waves representing a single color represents brightness of the color. [*E.g.*, yellow and cyan have highest and next-highest brightnesses in Fig. 6(b) and are brightest of the six portrayed on color bar pattern, Fig. 6(a)].
2. At any brightness level, the amplitude of a group of waves representing a color corresponds to the saturation of the color. The word "purity" has been applied to this characteristic and it indicates the extent to which the color approaches that of light of a single wavelength. Low purity (amplitude) would indicate dilution with other colors, tending to make the resultant move toward some shade between black and white.
3. The phase of the group of waves representing a single color determines the hue of the color.

Fig. 6 also shows the signal corresponding to black-and-white. When the spot formed by the three converging beams passes over the lower half of the image (corresponding to the black-and-white portion of the subject material), the gamma corrected color outputs are equal; they are equal to approximately zero for the left part of the lower half of the picture. They remain equal, but assume high values (unity) for the white area shown at the lower right. The video waveform signal corresponding to this lower picture area is indicated by the heavy solid line at the zero potential level and at the 100 level.

Signal Reception

Once the general scheme for producing the signal is understood, the method of demodulating it to provide signals for each of the three guns in the color tube is rather easily followed. The method is indicated schematically in Fig. 7 on the following page.

There is no attempt made to separate out the chrominance signal from the luminance signal by toothed, or comb, filters. The complete signal is used for a luminance signal as indicated, although the chrominance information in it is unwanted. This unwanted signal, however, has such a frequency composition as to greatly reduce its visibility in the picture. This is because the error it produces in the picture effectively phases out in the succession of lines and fields by means of which the picture is presented. Specifically, if the chrominance signals produce a brightness error at one spot on the picture, as this spot is traversed by the resultant beam from the three guns, an error of opposite sign will be produced at this location in the horizontal motion of the spot on the next line in that field. That is, if the error due to chrominance is too bright a spot in the first line referred to above, the corresponding spot will be too dark on the next traverse of the beam across the picture. These errors are therefore close together on the picture; they are of opposite sign and occur rapidly. These three factors tend to reduce their visibility. Also, when the subject material is black-and-white (or any shade of gray in between), the error disappears altogether because the color subcarrier disappears. As a further safeguard against brightness error due to chrominance signal, manufacturers of color sets are using a low-pass filter to cut off the luminance signal at about 3 mc, cutting off also the chrominance signal, which is an error signal so far as luminance is concerned. The philosophy is that a 3 mc luminance signal *without* the chrominance error signal is better than a 4.2 mc luminance signal *with* the chrominance error signal. This is indicated in Fig. 7 by the chrominance signal elimination filter characteristic applied to the luminance signal.

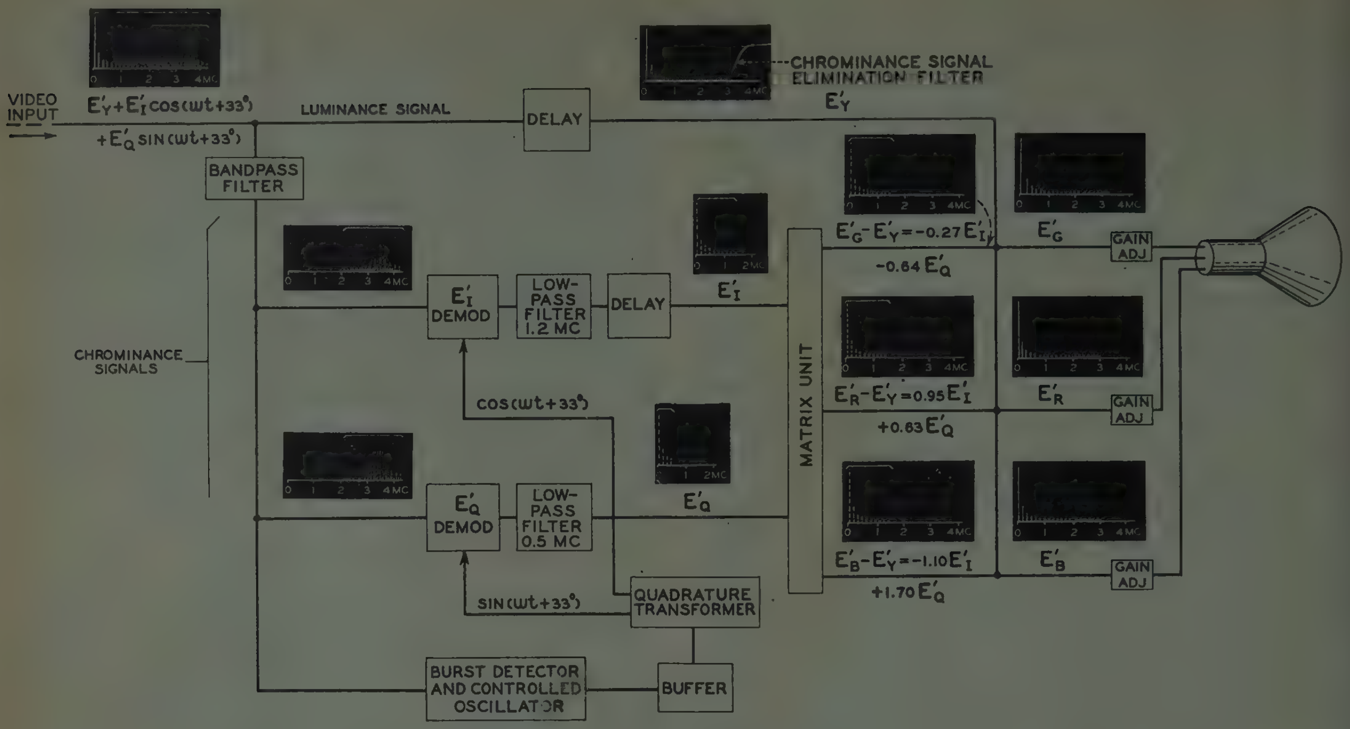

VIDEO INPUT
E'Y+E'I COS(ωt+33°)
+E'Q SIN(ωt+33°)
LUMINANCE SIGNAL
DELAY
CHROMINANCE SIGNAL ELIMINATION FILTER
E'Y
BANDPASS FILTER
CHROMINANCE SIGNALS
E'I DEMOD
LOW-PASS FILTER 1.2 MC
DELAY
E'I
COS(ωt+33°)
E'Q DEMOD
LOW-PASS FILTER 0.5 MC
E'Q
SIN(ωt+33°)
QUADRATURE TRANSFORMER
BURST DETECTOR AND CONTROLLED OSCILLATOR
BUFFER
MATRIX UNIT
E'G−E'Y=−0.27E'I
−0.64E'Q
E'R−E'Y=0.95E'I
+0.63E'Q
E'B−E'Y=−1.10E'I
+1.70E'Q
E'G
E'R
E'B
GAIN ADJ
GAIN ADJ
GAIN ADJ
0 1 2 3 4MC
0 1 2MC

Fig. 7—Schematic of equipment component functions for receiving NTSC color video signals.

As indicated in Fig. 7, a band pass filter is used in the chrominance branch to remove the low frequency luminance signal. The chrominance signals are demodulated with a synchronous demodulator and the E'_i and E'_Q components are derived. The error in the chrominance signal due to the high frequency luminance signal is small because (1) the error signal components are small; (2) synchronous detection plus low-pass filtering are used so that the high frequency positive and negative errors are effectively eliminated.

It is more convenient at the receiver to derive the "color difference" signals first from the chrominance signals. This can be done by combining different fractions of the E'_i and E'_q as follows:

$$E'_G - E'_y = -0.27E'_i - 0.64E'_q$$
$$E'_R - E'_y = 0.95E'_i + 0.63E'_q$$
$$E'_B - E'_y = -1.10E'_i + 1.70E'_q$$

These equations follow directly from the equations shown on Fig. 3.

The luminance signal is then added to each of the three color difference signals, thus forming the three primary color signals.

$$(E'_G - E'_y) + E'_y = E'_G$$
$$(E'_R - E'_y) + E'_y = E'_R$$
$$(E'_B - E'_y) + E'_y = E'_B$$

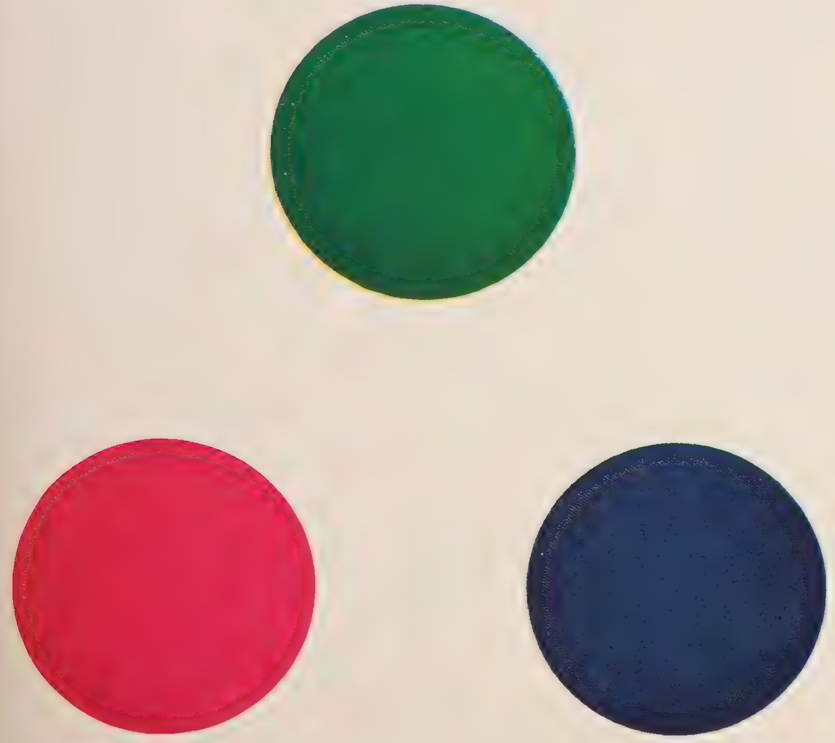
These three signals correspond exactly (except for the errors discussed above) to the gamma corrected color signals put out by the camera, and are applied through separate gain-adjusting networks to the three guns of the color tube. The gain adjustments are for the purpose of proportioning the beam currents to produce radiations from the phosphors which will produce white (or shades of gray to black) when equal voltages are applied to inputs of gain adjusting networks. The manner in which color tube uses these signals has been explained.

TRANSMISSION OF THE COLOR SIGNAL

The color signal which must be transmitted has been described here in two ways: (1) amplitude vs frequency (Fig. 5), and (2) amplitude vs time (Fig. 6(b)). It will be apparent from Fig. 5 that since the color is carried by a frequency of 3.58 mc and sidebands, it is important that this frequency region be transmitted with high fidelity. Subjective tests indicate that a 1 db change in the response of the circuit at 3.58 mc can be easily detected, and a loss of 3 db in this region, compared to the transmission at low frequencies (luminance transmission) begins to be objectionable. In other words, transmission at 3.58 mc is as important for chrominance as is transmission at low frequencies (below 1 mc) for luminance. This added requirement for color signal transmission necessitates more exacting maintenance of circuit response.

The second requirement which makes color TV transmission more difficult is the delay requirements. In this case, the delay characteristic of most importance is the differential delay characteristic at the color subcarrier frequency; *i.e.*, variation in delay with the various voltage positions the subcarrier may occupy in transmission, rather than the delay characteristic most frequently referred to in wide-band transmission, which is delay vs frequency. This latter delay must also be

FIG. 1 PRIMARY COLORS OF THE ADDITIVE SYSTEM



a. Shown separately

b. Shown partially merged

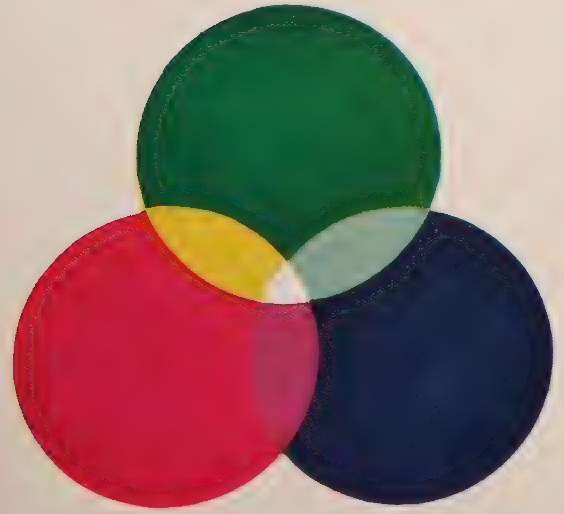


FIG. 4 COLOR CIRCLE DIAGRAM

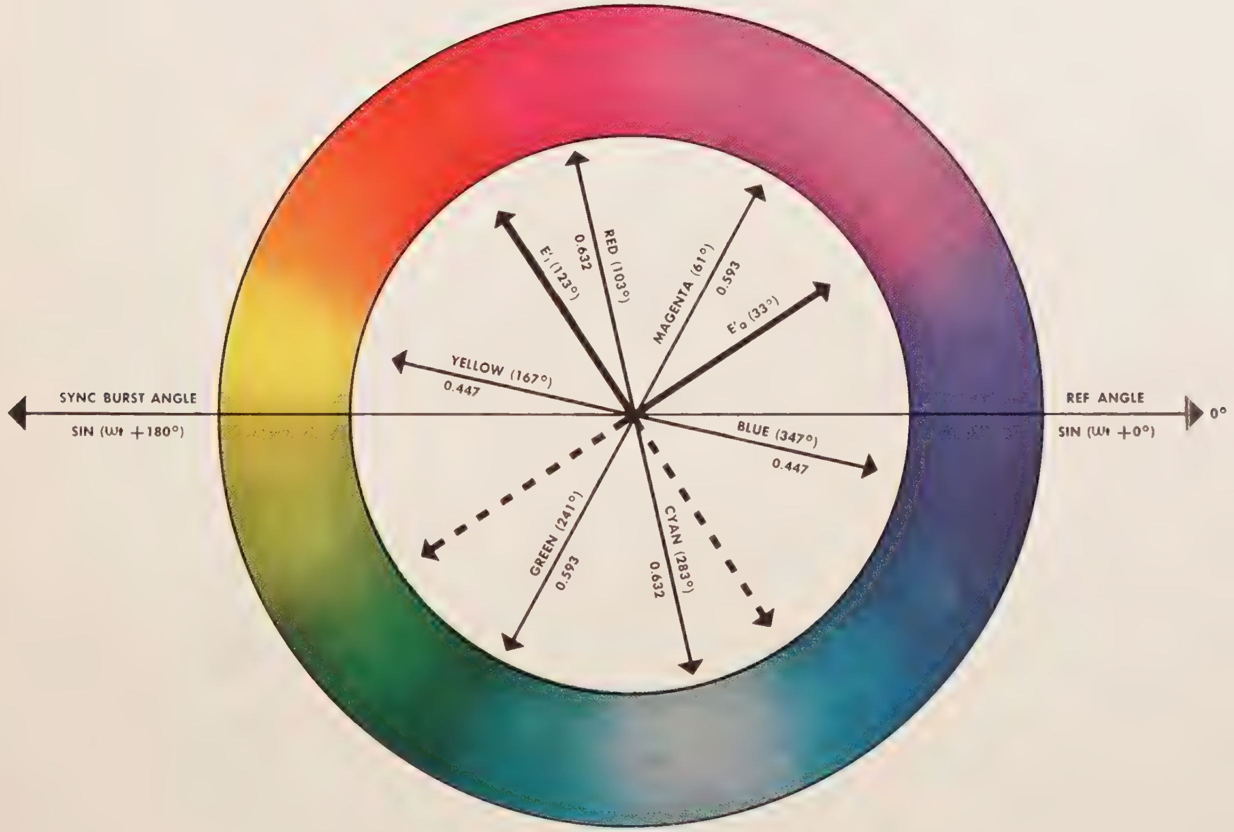
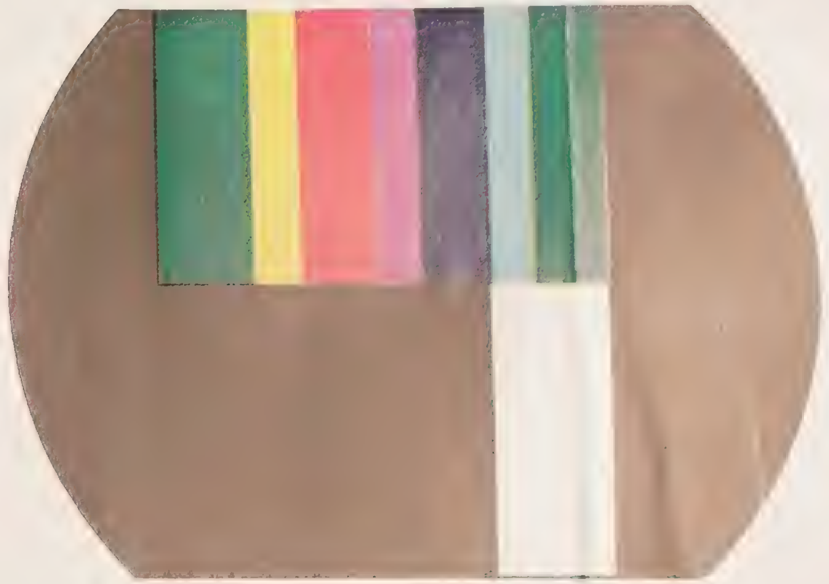
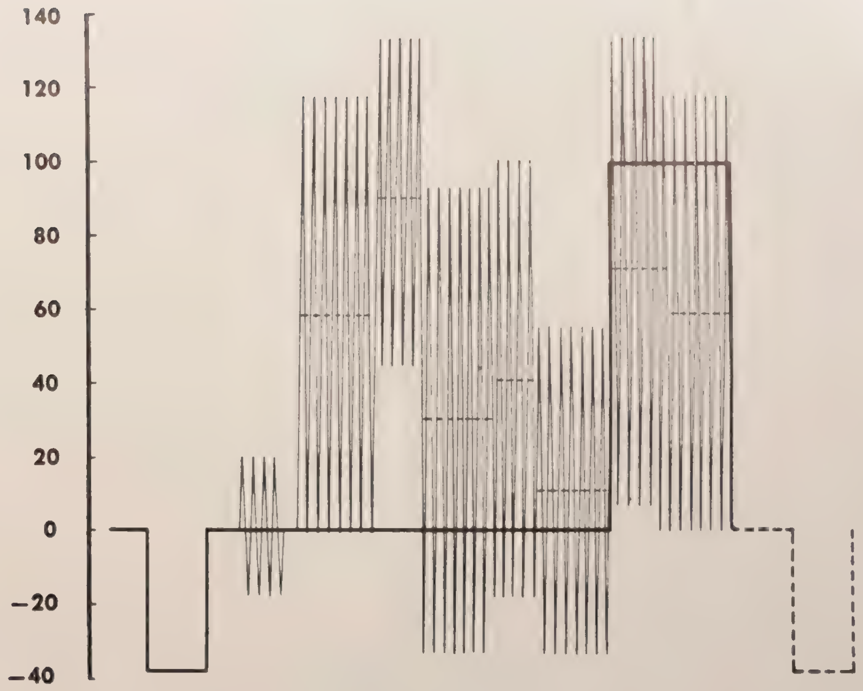

SYNC BURST ANGLE
SIN (ωt +180°)
REF ANGLE
SIN (ωt +0°)
0°
E'_I (123°)
0.632
RED (103°)
MAGENTA (61°)
0.593
E'_Q (33°)
YELLOW (167°)
0.447
BLUE (347°)
0.447
GREEN (241°)
0.593
CYAN (283°)
0.632

FIG. 6 COLOR BAR PATTERN AND CORRESPONDING COLOR VIDEO SIGNAL



a. Color bar pattern



b. Color video signal

maintained constant over the whole frequency band within rather narrow tolerances.

Fig. 6 shows that different colors are transmitted at different potential levels through the transmission systems. For example, the axis of the synchronizing burst is at a zero level in the figure, while that of the group of waves transmitting the yellow signal is at a level of 0.89. Since, in the receiving set, the hue of the color is determined by the relationship of the phase of the synchronizing burst and that of the group of waves carrying the color information, it is necessary that the relationship between the phases of these groups of waves be preserved with great fidelity from the point of signal generation to the point where the signal is used. In the example cited, if the group of waves carrying the yellow color information is shifted in phase by as much as 5 degrees with respect to the phase of the waves in the synchronizing burst, a change in hue will be noticed in the picture. If the phase of the yellow color-carrying group of waves is advanced, the yellow color in the picture will become slightly greenish; if the phase is retarded, it will move slightly towards the orange (see Fig. 4). Hence, a differential phase requirement is born, which was not given serious consideration before the advent of color TV. It was considered necessary in overall transmission to maintain differential phase shift within about $\pm 5°$ limits at color subcarrier frequency.

In regard to compatibility, when a monochrome receiver is fed color signals, only the luminance signal is required. Referring to Fig. 7, the circuitry for selecting the high frequency chrominance components and demodulating them into color difference signals is not present, and the one gun in the monochrome tube is supplied with the luminance signal, plus the interleaved chrominance signal. As was explained above, the frequency composition of the chrominance signal, which is an error signal so far as luminance is concerned, is of such a nature that its visibility is reduced. In a given small area in a picture, plus- and minus-errors will occur in rapid succession and human vision tends to average them out. Hence, it may be said that the signal is so designed that when received by a monochrome receiver, the visibility of the chrominance portion of the signal in the picture area is materially reduced.

When a color receiver is fed a monochrome signal, the outputs of the synchronous demodulators equal zero; the color difference signals are zero; and therefore, the signal supplied to the gain-adjusting network associated with each gun is the same, namely, the E'_y signal. With equal inputs at these points the beams are of the proper relative strength to produce black-and-white.

CONCLUSION

It is beyond the scope of this article to go into further detail in regard to how the severe requirements of television transmission are met. It will be sufficient to say that in spite of bandwidths about one thousand times as great as those used for single telephone channels, more severe transmission requirements than those used for telephone transmission are necessary for monochrome TV transmission. More severe requirements must be applied for color television signals, primarily due to the necessity for maintaining amplitude responses constant over the whole 4 mc band, and to the differential delay requirement. Steps are being taken to satisfy these needs, and it is expected that in the reasonably near future, regular color transmissions will be achieved with only moderately-increased difficulty over that encountered in the past for monochrome transmissions.

Information on the formation of color TV signals was obtained largely from the reports of Panels 12 and 13 of the National Television Systems Committee. A short bibliography of particular articles of interest is given for the benefit of readers who would like to learn more of the details of the NTSC color system.

BIBLIOGRAPHY

1. Report of Panel 12. National Television Systems Committee; cf. NTSC Monograph No. 4A.
2. Report of Panel 13. National Television Systems Committee; cf. "Recommendations," Chairman's Report.
3. Mc Ilwain, K., and Dean, C. E., "Principles of Color Television," Reports of Hazeltine Corporation. To be published as a book by John Wiley and Sons, New York, N. Y.
4. Petition of the National Television System Committee for Adoption of Transmission Standards for Color Television, July 21, 1953.
5. Fink, D. G., "NTSC Color Television Standards." *Electronics*, Vol. 26, No. 12 (December, 1953), pp. 138–150.
6. Law, H. B., "A Three-Gun Shadow Mask Color Kinescope." PROCEEDINGS OF THE IRE, Vol. 39, No. 10 (October, 1951), pp. 1186–1194.

CORRECTION

M. M. McWhorter and J. M. Pettit, authors of the paper, "The Design of Stagger-Tuned Double-Tuned Amplifiers for Arbitrarily Large Bandwidth," which appeared on pages 923–931 of the August, 1955 issue of the PROCEEDINGS OF THE IRE, have brought the following corrections to the attention of the editors.

1. In discussion of Fig. 4, three lines below Fig. 5, the equation in text should read

$$\gamma = \omega_u/\omega_l$$

2. Subscript *e* in Fig. 7 should be *l*.
3. In Fig. 20, the axes should be $j\Omega$ and Σ.
4. Five lines below Eq. (12) should read poles *a* and *f*, *b* and *e*, *c* and *d*.

Electronically-Controlled Audio Filters*

L. O. DOLANSKÝ†, SENIOR MEMBER, IRE

Summary—**The use of filters whose cutoff characteristics are controllable by electronic means is often desirable in problems dealing with audio signals. Based on the recent work on fixed RC active filters by J. G. Linvill, variable active low-pass and high-pass filters have been developed using transistor negative-impedance converters.**

The design theory of such filters is summarized, and measured characteristics and other experimental results are presented. An application, in which the cutoff characteristics are controlled by the incoming audio signal for use in formant tracking, is described, and experimental results are given.

INTRODUCTION

IN CERTAIN problems dealing with audio signals[1] it is desirable to use filters whose cutoff characteristics are continuously variable in accordance with an applied voltage or current signal, preferably with a minimum of delay. The requirement of variable cutoff characteristics implies (a) that some of the filter components can be varied almost instantaneously by means of a suitable control signal and (b) that such a control signal can be obtained. The control signal may either be related to some property of the incoming audio signal, or it may be generated by independent means.

In the application considered, a low-pass and high-pass filter were required, both having cutoff frequencies continuously variable between 200 and 1,000 cps.

THEORETICAL CONSIDERATIONS

The filter design adopted was based on the recent work on fixed RC active filters by J. G. Linvill.⁽¹⁾ In this design a negative-impedance converter is used in addition to passive elements; however, the magnitude of the reactive filter elements used here can be varied by electronic means so that electronically variable filter cutoff frequencies are obtained.

The negative-impedance converter transforms the impedance of a two-terminal network by changing the sign of the impedance value. While the need for electronically-controllable elements is thereby not eliminated, the availability of negative impedances results in a greater flexibility of the filter design. For example, a positive resistance present in a physical inductor can be reduced or canceled by connecting a negative resistance $-R$ in series with the inductor. The negative resistance $-R$ can be made to appear between the input terminals of a negative-impedance converter by connecting $+R$ across its output terminals.

The block diagram of either the low-pass or the high-pass filter constructed is shown in Fig. 1. The transfer function of the entire filter in terms of the open circuit driving-point and transfer impedances of the individual networks can be shown to be equal to

$$\begin{aligned} H(s) &= Z_{21}\Big|_{I_2=0} = \frac{E_2}{I_1}\Big|_{I_2=0} \\ &= \left[\frac{-1}{(z_{12})_a}\cdot\frac{(z_{11})_b}{(z_{12})_b} + \frac{(z_{22})_a}{(z_{12})_a}\cdot\frac{1}{(z_{12})_b}\right]^{-1} \\ &= \frac{(z_{12})_a(z_{12})_b}{(z_{22})_a - (z_{11})_b}. \end{aligned} \tag{1}$$

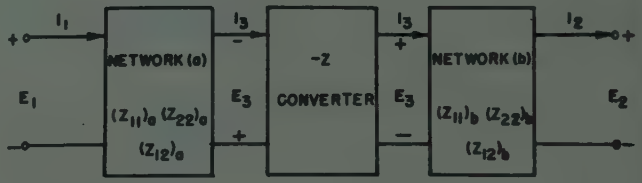


Fig. 1—Block diagram of HP or LP filter.

$H(s)$ will be a ratio of two polynomials and can be written

$$H(s) = \frac{N(s)}{D(s)}. \tag{2}$$

In order to synthesize $H(s)$ by means of RC and RL networks only, it is convenient to divide both $N(s)$ and $D(s)$ by

$$M(s) = (s - \sigma_1)(s - \sigma_2)\cdots(s - \sigma_n) \tag{3}$$

where $\sigma_1, \sigma_2 \cdots \sigma_n$ represent the poles of $(z_{22})_a$ and $(z_{11})_b$. The denominator of $H(s)$ becomes

$$\begin{aligned} D'(s) &= \frac{D(s)}{\prod_{i=1}^{n}(s-\sigma_i)} \\ &= k_0 + \sum_{i=1}^{n}\frac{k_i}{s-\sigma_i} = (z_{22})_a - (z_{11})_b, \end{aligned} \tag{4}$$

while the numerator is equal to

$$N'(s) = \frac{N(s)}{\prod_{i=1}^{n}(s-\sigma_i)} = (z_{12})_a(z_{12})_b. \tag{5}$$

If, in (4), the positive k's are associated with $(z_{22})_a$ and the negative ones with $(z_{11})_b$, the networks a and b can be synthesized; e.g., by Cauer's continued fraction expansion. The negative sign before $(z_{11})_b$ is supplied by the negative-impedance converter.

---

* Original manuscript received by the IRE, March 2, 1955; revised manuscript received June 24, 1955. This paper was presented at the National Convention of the IRE, New York, N. Y., March 22, 1955. The work in this paper was performed under Contract AF19 (604)-1039 with the Air Force Cambridge Research Center of the Air Research and Development Command.

† Electronic Research Project, Northeastern University, Boston, Mass.

[1] E.g., formant tracking in speech analysis.

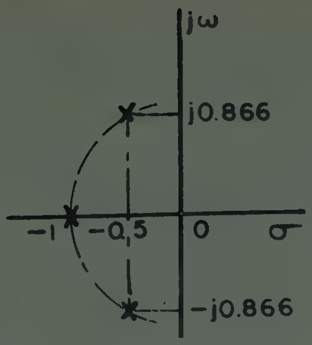

jω
j0.866
−1
−0.5
0
σ
−j0.866

Fig. 2—Pole pattern for Butterworth LP filter.

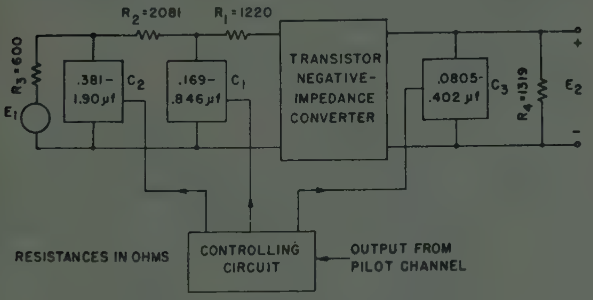

R₂=2081
R₁=1220
R₃=600
E₁
.381-1.90μf
C₂
.169-.846μf
C₁
TRANSISTOR NEGATIVE-IMPEDANCE CONVERTER
.0805-.402 μf
C₃
R₄=1319
E₂
+
−
RESISTANCES IN OHMS
CONTROLLING CIRCUIT
OUTPUT FROM PILOT CHANNEL

Fig. 3—Simplified circuit diagram of electronically-controllable LP filter.

Low-Pass Filter

The desired low-pass filter characteristic is of the Butterworth type ($n=3$), so that, in normalized form,

$$H(s) = \frac{k}{(s+1)(s^2+s+1)} \tag{6}$$

The distribution of the poles of $H(s)$ is shown in Fig. 2. A considerable freedom of choice exists about the location of the σ_i's. In the present design, $\sigma_1=-0.3$, $\sigma_2=-1.05$ and $\sigma_3=-1.5$ have been chosen. The circuit element values, after scaling to a suitable frequency and impedance level, are given in Fig. 3. As indicated in the diagram, three electronically controllable capacitors are used in the filter. The negative-impedance converter⁽²⁾ simulates at its input terminals the negative of the physical impedance connected across its output terminals, which in this case is composed of a 1,319-ohm resistor and a capacitor whose value varies between 0.0805 and 0.402 μf.

Negative-Impedance Converter

The requirements which the negative-impedance converter must meet exceed the possibilities of a combination of passive elements alone. The converter must therefore contain active elements as well. As indicated by Fig. 4, two transistors are included in the negative-impedance-converter circuit. When Z_L is connected to the output terminals, the apparent input impedance Z_{in} is approximately equal to $-Z_L$. Since this circuit differs only in minor details from the original design described by J. G. Linvill,⁽¹⁾ a detailed description of its operation will be omitted here. Fig. 5 represents the values of the input impedance magnitude $|Z|$ and phase angle θ for a purely resistive $Z_L=1.02$ kohm. It is seen that $|Z|$ is substantially constant for 200 cps$<f<$ 20 kc, and increases rapidly for frequencies lower than 200 cps. The phase varies from -10.5 degrees to $+12.5$ degrees for 100 cps$<f<$ 10 kc.

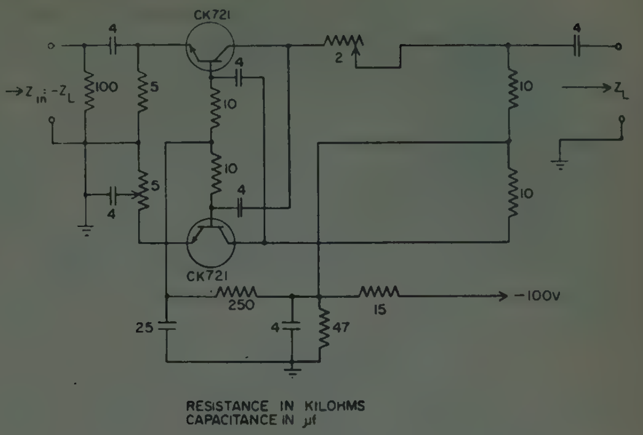

CK721
4
2
4
4
→Z_in=−Z_L
100
5
10
10
→Z_L
10
5
4
4
10
CK721
250
15
→ −100V
25
4
47
RESISTANCE IN KILOHMS
CAPACITANCE IN μf

Fig. 4—Transistor negative-impedance converter.

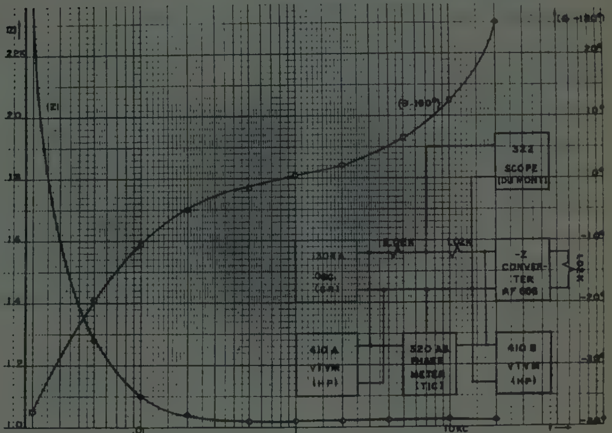


Fig. 5—Values of $|Z|$ and (θ-180 degrees) vs frequency.

Variable C Circuit

In the electronically-controllable low-pass filter three electronically-controllable capacitors are required. A three-tube circuit, whose apparent input capacitance can be varied by means of a varying dc voltage, has been designed. The operation, which is based on the so-called Miller effect, can be explained by means of the simplified circuit shown in Fig. 6 (next page).

Assuming that the loading of the plate circuit by C_2 is negligible, the input current

$$I = [j\omega C_1 + j\omega C_2(1+A)]E, \tag{7}$$

where

$$A = \text{stage amplification.}$$

Thus the input admittance

$$Y = I/E = j\omega[C_1 + C_2(1+A)]$$
$$= j\omega C_{eq}, \tag{8}$$

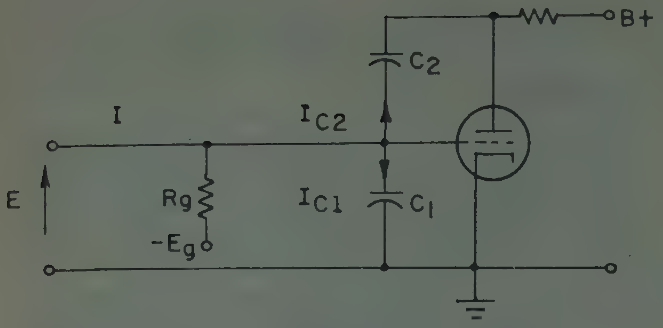


Fig. 6—Principle of operation of electronically variable capacitor.

if A is a real number.

The equivalent input capacitance

$$C_{eq} = C_1 + C_2(1 + A) \tag{9}$$

can be varied if the stage gain is varied, for example by varying the g_m of the tube.

In the present application, fairly large values of C_{eq} are required, which means that large grid-to-plate capacitors must be used. This causes the stage gain to become complex, so that the input impedance has a resistive component as well. The loading of the plate circuit by C_2 is not negligible. To remove this excessive loading of the plate circuit, a cathode follower has been inserted between the plate load resistor and C_2.

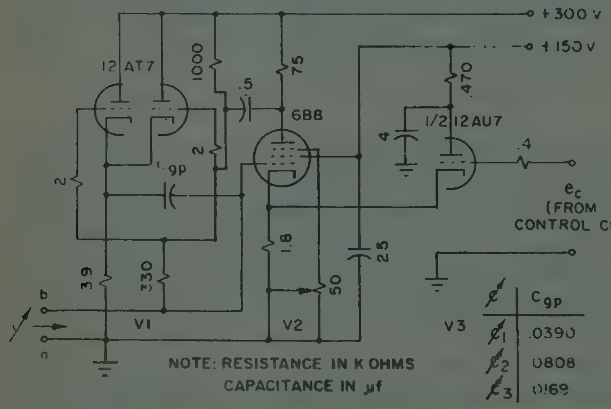


Fig. 7—Circuit diagram of electronically controllable capacitors.

The complete variable-capacitor circuit is shown in Fig. 7. The heart of the circuit is a type 6B8 variable-g_m tube (V_2). The gain of this stage varies according to the variations in the grid-to-cathode voltage. These variations are achieved by controlling the dc input to V_3. The first stage (V_1) represents the isolation cathode follower mentioned before. The variable capacitor $\not{C}$ appears between the terminals a and b. For each of the three variable capacitors used in the low-pass filter a different value of C_{gq} must be used, as indicated in the table of Fig. 7. Otherwise the three circuits are identical.

Tracking of the Electronically Controllable Capacitors

Each of the controllable capacitors should be capable of a 5:1 variation in apparent capacitance, corresponding to the 5:1 variation in filter cutoff frequency. Moreover, the same increment in control voltage e_c should vary the capacitance values by the same ratio for all three capacitors. The measured values of apparent input capacitances $\not{C}_1$, $\not{C}_2$, $\not{C}_3$ are shown in Fig. 8. The ratios of the capacitance values vary over the following ranges as shown in Table I:

TABLE I

Ratio	Desired Value (for 200 cps $<f<$ 1,000 cps)	Measured Value
$\not{C}_1/\not{C}_2$	0.445	0.443–0.516
$\not{C}_2/\not{C}_3$	4.73	4.40 –4.70
$\not{C}_1/\not{C}_3$	2.11	2.00 –2.42

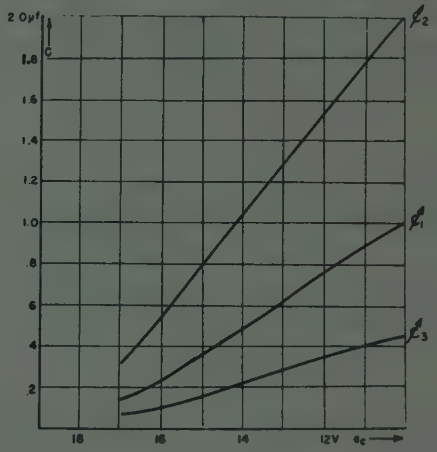


Fig. 8—Variation of $\not{C}_1$, $\not{C}_2$ and $\not{C}_3$ vs control voltage e_c.

Experimental Circuit

A circuit diagram of the entire electronically-controllable low-pass filter is presented in Fig. 9. A cathode-follower circuit (V_1) is included to provide the proper impedance for the low-impedance input of the filter; it also prevents any disturbing loading of the preceding 850-cps LP filter. Tubes V_2 through V_{10} represent the three controllable capacitors while the filter resistors are shown before and after the negative-impedance converter.

HIGH-PASS FILTERS

Low-pass-High-pass Transformation

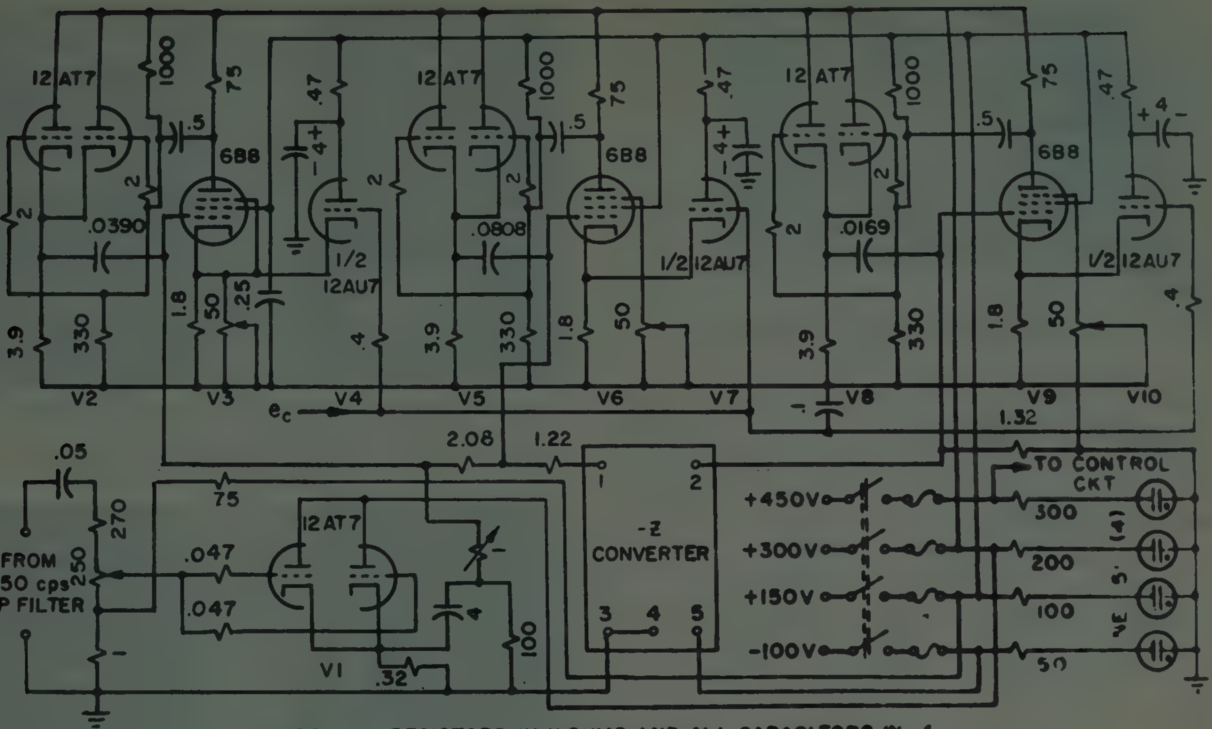
If in the original low-pass filter expressions (see (6)) s is replaced by $1/s$, a high-pass filter with the same cutoff frequency is obtained. The impedances which replace the variable capacitors must vary in proportion to s instead of $1/s$ as was required in the low-pass case. Thus an electronically controllable inductor[2] is needed in the high-pass filter.

Driving Circuit for "Incredoctor"

The "Incredoctor" is a saturable inductor and its inductance depends upon the degree of magnetic saturation of the core which in turn depends upon the mag-

---

[2] A suitable unit has recently been manufactured by CGS Laboratories under the name "Incredoctor."


12 AT7
1000
75
.5
6B8
.47
4
12 AT7
1000
75
.5
6B8
.47
4
12 AT7
1000
75
.5
6B8
.47
4
2
.0390
1/2 12AU7
.0808
1/2 12AU7
.0169
1/2 12AU7
3.9
330
1.8
50
.25
.4
3.9
330
1.8
50
3.9
330
1.8
50
.4
V2
V3
V4
V5
V6
V7
V8
V9
V10
e_c
2.08
1.22
1.32
.05
270
75
FROM 850 cps LP FILTER
250
.047
.047
12 AT7
V1
.32
100
4
-Z CONVERTER
1
2
3
4
5
+450V
+300V
+150V
-100V
TO CONTROL CKT
300
200
100
50
(4) 5.9E

NOTE· ALL RESISTORS IN K OHMS AND ALL CAPACITORS IN µf

Fig. 9—Electronically controlled LP filter.

nitudes of the currents in two available control windings. While a control voltage source was necessary to achieve the desired variations of the capacitors in the low-pass case a suitable current source had to be designed to vary the variable inductors over the desired range in the high-pass case. It was desired, however, to start with the same original control signal for both filters. Hence, a circuit for transforming variations of voltage into variations of a current source has been designed, as shown in Fig. 10. The control voltage in this circuit is fed into the 6AG7 pentode which represents an approximate current source.

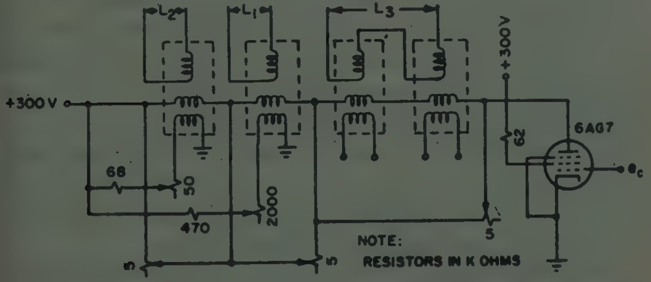

L_2
L_1
L_3
+300 V
+300 V
68
50
470
2000
62
6AG7
e_c
5
5
5
NOTE:
RESISTORS IN K OHMS

Fig. 10—Control circuit for electronically controlled HP filter.

Tracking of the Electronically Controllable Inductors

As in the case of the electronically-controllable capacitors, the inductors should change by the same ratio for a given change in control signal. This is achieved by connecting all the main control windings of all Increductors in series and bypassing each of them by a suitable resistor so that only the desired fraction of the total varying control current passes through the winding. A constant difference in magnetization between any two Increductors can be achieved by means of the second control winding, usually called "bias" winding, which is connected to +300v through a suitable resistor.

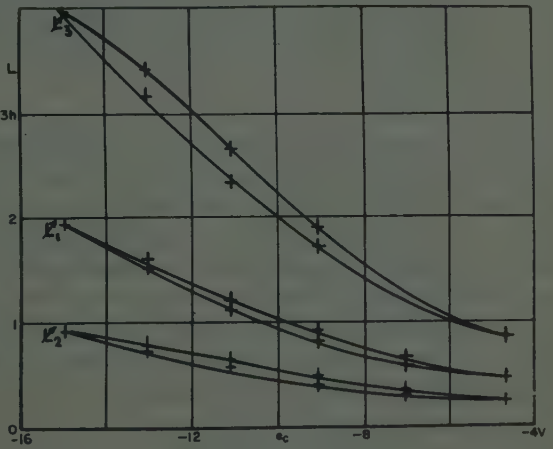


Fig. 11—Variation of L_1, L_2 and L_3 vs control voltage e_c.

The measured variation of the electronically controllable inductors is given in Fig. 11. Because of the large control-winding inductance and comparatively small parallel resistance, the time constant of the control circuit is somewhat excessive. It is believed that this drawback can be minimized by using a separate control pentode for each Increductor, and by reducing the total control current, rather than by passing a part of it through the parallel resistor. Another difficulty en-

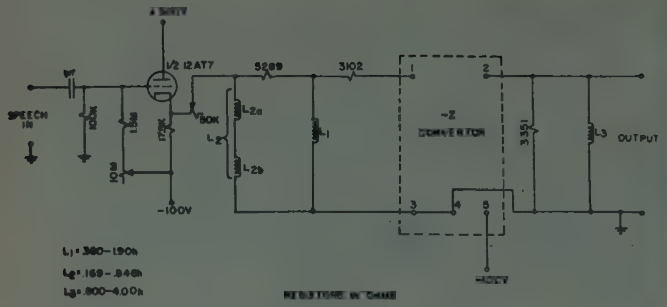


Fig. 12—Electronically controlled HP filter.

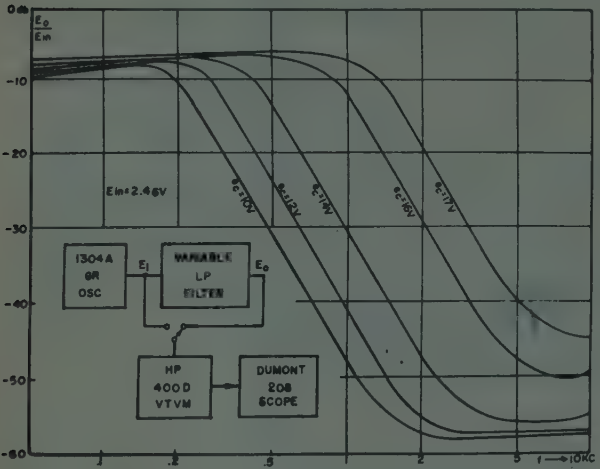


Fig. 13—Response of electronically controlled LP filter for various values of control voltage e_c.

countered with the use of Increductors is a certain amount of hysteresis. Both these effects will be demonstrated presently by means of dynamic-behavior oscillograms, representing the output signals of the filters.

Experimental Circuit

Fig. 12 represents the electronically controllable high-pass filter, without the control circuit which has already been shown in Fig. 10. As in the case of the low-pass filter, two of the variable reactances are before, one behind, the negative-impedance converter. In order to secure more favorable conditions with respect to hysteresis and Q, L_2 is composed of two Increductors L_{2a} and L_{2b}. In this way it is possible to operate all Increductors nearer to their optimum ranges.

EXPERIMENTAL RESULTS

Low-Pass Filter

A family of curves representing the sinusoidal steady-state response of the low-pass filter for various values of the control voltage e_c is given in Fig. 13.

The attenuation in the stop-band is at a rate of about 17 db per octave. The theoretically expected value is 18 db per octave. Once the attenuation of 35 db is reached, the response remains below this value for all higher frequencies. The residual output at these higher frequencies seems to be mostly due to high-frequency noise

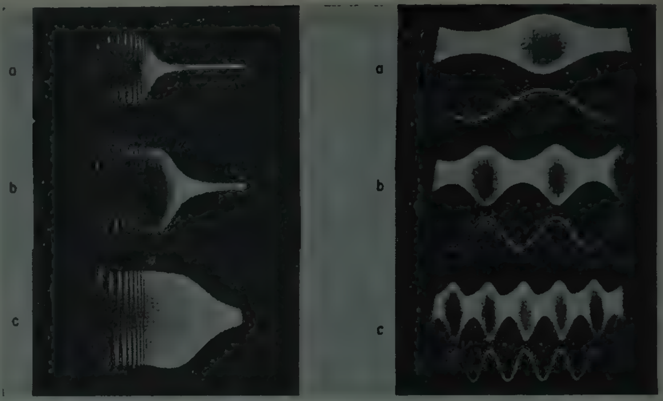


Fig. 14—Filter output for varying input signal frequency and control voltage. (Left: $f_s = 100$–$1{,}500$ cps, e_c adjusted for $f_c = 200$ cps (a), 500 cps (b), 1,000 cps (c).) (Right: $f_s = 500$ cps, sinusoidal control voltage, $f_{cv} = 5$ cps (a), 10 cps (b), 20 cps (c).)

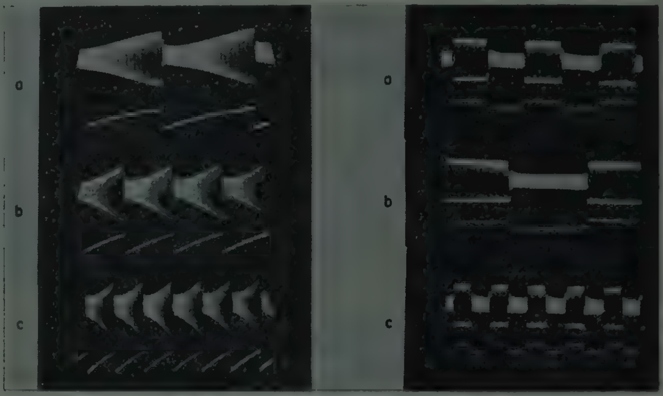


Fig. 15—Filter output for fixed input signal frequency and varying control voltage. (Left: $f_s = 500$ cps, saw-tooth control voltage, $f_{cv} = 5$ cps (a), 10 cps (b), 17 cps (c).) (Right: $f_s = 500$ cps, square-wave control voltage, $f_{cv} = 10$ cps (a), 5 cps (b), 20 cps (c).)

generated by the transistor-negative-impedance circuit, with a smaller component due to 60 cps hum. A larger input signal will increase the difference between the pass-band and stop-band response, but at the same time a distortion of the sinusoidal output is observed.

Fig. 14(a) represents the output of the low-pass filter for three values of the control voltage, corresponding to three cutoff frequencies—200 cps, 500 cps and 1,000 cps—when the frequency of a constant-magnitude signal sweeps between 100 and 1,500 cps. In Fig. 14(b) the input-signal frequency is fixed but the control voltage varies sinusoidally at various rates. In Figs. 15(a) and 15(b) the control signal varies in a saw-tooth and square-wave fashion, respectively, the remaining conditions being the same as in the preceding figure.

Sudden changes in the control signal cause transients in the output signal, as indicated in Fig. 15. This is due to the fact that the desired change in g_m of the variable-g_m tube V_2 (see Fig. 7) is accompanied by dc level transients in various parts of the variable-capacitor circuit. Since in the present application this effect appears to cause little error in the final result, no effort has been made to eliminate these formants. If necessary, however, an attempt could be made to balance the dc step at the plate of V_2 by another step of equal magnitude

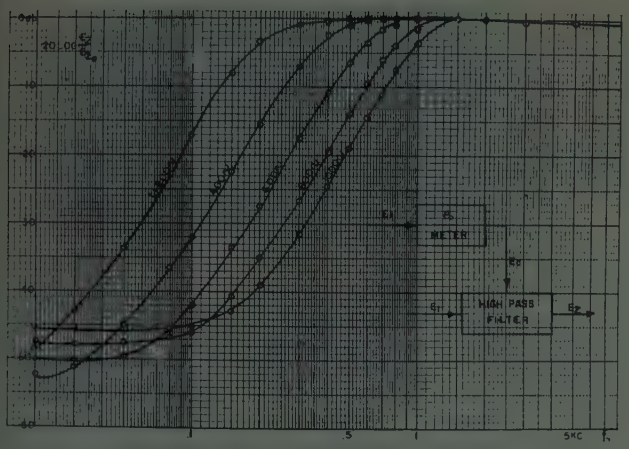


Fig. 16—Response curves of electronically controlled HP filter for various values of input frequency.

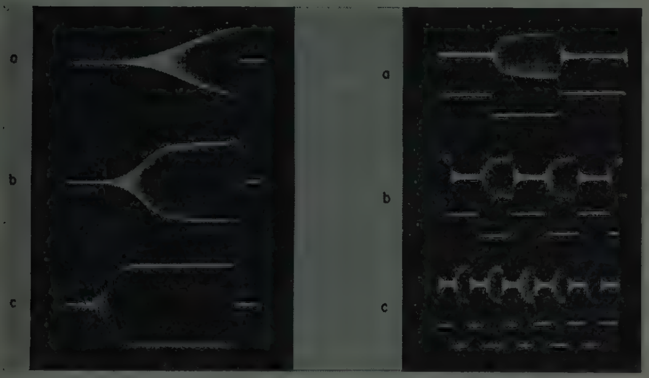


Fig. 17—Dynamic response characteristics of electronically controllable high-pass filter. (Left: sinusoidal sweep 0–1,500 cps, $e_s=2$v rms, $f_i=1{,}000$ cps (a), 500 cps (b), 200 cps (c).) (Right: $f_s=300$ cps, $e_s=2$v rms, $e_c=8.8$v dc plus square wave 10v peak-to-peak, $f_c=5$ cps (a), 10 cps (b), 20 cps (c).)

and opposite polarity, so that the dc level at the plate of V_2 would remain undisturbed.

High-pass Filter

A family of measured response curves of the electronically-controllable high-pass filter is given in Fig. 16. It is seen that desired 5:1 variation in cutoff frequency can be achieved, and filter attenuates at about 16 db per octave with a stop-band attenuation of 45 db or more.

The response for a constant-magnitude sweeping-frequency input signal is demonstrated by Fig. 17(a), three fixed values of the control signal corresponding again to three cutoff frequencies. The response of the filter in the case of a constant sinusoidal signal, with the control voltage varying in a square-wave fashion, is shown in Fig. 17(b). Although the control voltage assumes the new value almost instantaneously, the output reaches the new steady-state response only after considerable delay.

Fig. 18 represents the output of the filter when the control voltage is varied very slowly in a triangular fashion, so that the sluggishness of the control circuit is minimized. This oscillogram is indicative of the effect of hysteresis upon the filter response. Variations of up to about 10 per cent of the total inductance value have been observed when the Increductor is subjected to the maximum control-current variation, which is required for the 5:1 change in inductance.

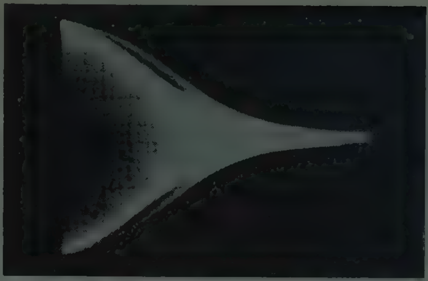


Fig. 18—Hysteresis display, sweep rate 0.33 cps, triangular variation of e_c between 3.6v and 16v.

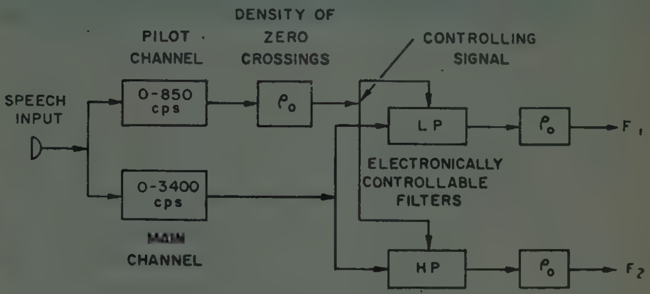


Fig. 19—A scheme for formant tracking.

APPLICATION TO FORMANT TRACKING

The short-time power spectrum of most speech sounds has several broad peaks along the frequency axis; these concentrations of sound energy are sometimes called formants. The formant frequency indicates their approximate location on the frequency axis. When time and frequency are represented on the horizontal and vertical axes, respectively, while the presence of relatively large amounts of sound energy is represented by dark areas, the so-called "visible speech" pattern is obtained. An example of such a record is shown in Fig. 20, where the formants are represented by the dark bars.

Since the formants are significantly different for different sounds, it is often desirable to obtain automatically an approximate continuous indication of the varying values of the formant frequencies. The block diagram of Fig. 19 represents a scheme for the separation of the formants.(3),(4) An 850 cps LP filter eliminates that part of the power spectrum which, as a rule, does not contain the first formant. The density of zero-crossings of the remaining signal is converted into a voltage signal which controls the cutoff frequencies of a low-pass and a high-pass filter. The output of the low-pass filter should contain essentially only the first formant and a voltage proportional to the first formant frequency should appear at F_1. Similarly, the output of the high-pass filter should contain the second and possibly higher formants.

As an example of the performance of the electroni-

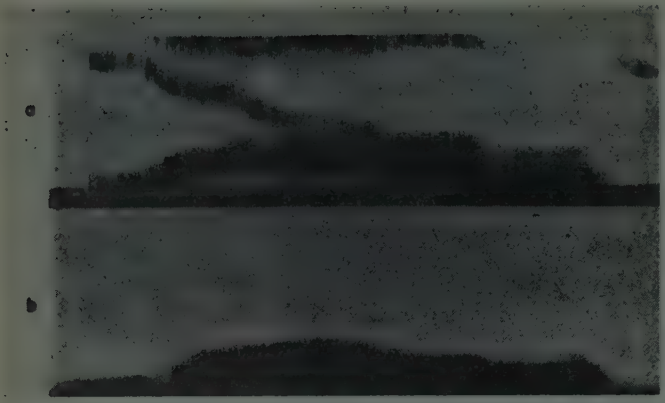


Fig. 20—Spectrograms for *i-ϵ-a-o-u*. (a) wide band, no filter; (b) wide band, variable LP filter. Note: the sonagraph was set on HS (high shaping).

cally-controllable low-pass filter, sound spectrograms of the sound sequence *i-ϵ-a-o-u* are shown in Fig. 20.

In these spectrograms, the formants are represented as dark bars whose vertical position, corresponding to frequency, varies with time. Fig. 20(a) represents the sound before filtering, while Fig. 20(b) shows the spectrogram after the sound sequence has been filtered through the electronically-controllable low-pass filter. It is seen that the separation of the first formant is accomplished reasonably well even if the second formant is very close to the first formant, as, for example, for *o* and *u*.

In Fig. 21, the behavior of the electronically-controllable high-pass filter is indicated by means of the oscillograms of the filtered and unfiltered sound *i*. It is seen that the lower frequency components have been attenuated considerably, although for the given purpose more attenuation would be desirable.

Conclusions and Limitations

In view of the investigations which have been reported in this paper, the following conclusions can be made:

1. The performance of the constructed electronically-controllable low-pass and high-pass filters have been found to be close to the expected behavior in the pass-band and in the cutoff region.

2. A suitable voltage source is needed for the control of the cutoff frequency of the low-pass filter.

3. A current source is needed for the control of the cutoff frequency of the high-pass filter.

4. The 5:1 range of the cutoff frequency is close to the maximum value which can be achieved with the present low-pass filter.

5. In the case of the high-pass filter, the range of the cutoff frequency is presently limited by the maximum current of the controlling pentode. However, if a larger current source were used, a deterioration of the slope in the cutoff region is to be expected because of the lower Q of the Increductors under such conditions.

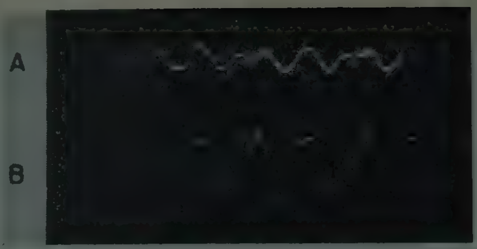


Fig. 21—Filtered (a) and unfiltered (b) samples of the sound *i*.

6. In the stop-band the response is at least 35 db below the maximum response for the low-pass filter, and about 45 db for the high-pass filter. A larger attenuation would be desirable, particularly in the low-pass case. The residual signal seems to be predominantly high-frequency noise, with a smaller hum component.

7. At present, the transistor-negative-impedance converter is the limiting factor for maximum signal size without distortion. However, the limitations imposed by the variable reactance elements are only slightly above the limitations of the transistor circuit.

8. Hysteresis causes the apparent inductance of the saturable inductors to vary by about 10 per cent, for the same value of the control current.

Acknowledgment

The author wishes to express his gratitude to the members of the Speech Project at Northeastern University, particularly to Professor M. W. Essigmann for his encouragement, to Dr. S. H. Chang for suggestions and criticism, to Dr. H. L. Stubbs for his suggestions during the preparation of this paper, and to Mr. C. Howard for his cooperation on details of circuitry and testing; the help extended to the author by Mrs. M. D. Reynolds and Mr. W. F. Goddard during the preparation of the manuscript is also very much appreciated.

Bibliography

(1) Linvill, J. G., "RC Active Filters." Proceedings of the IRE' Vol. 42, (March, 1954), pp. 555–564.
(2) Linvill, J. G., "Transistor Negative Impedance Converters." Proceedings of the IRE, Vol. 41, No. 6 (June, 1953), pp. 725–729.
(3) Interim Technical Report No. 1, Contract No. AF19(604)-1039, Item I, March 1, 1954 through August 31, 1954, Visual Message Presentation (Northeastern University).
(4) Scientific Report No. 2, Contract No. AF19(604)-1039, Item I, September 1, 1954 through February 28, 1955, Visual Message Presentation (Northeastern University).
(5) Peterson, G. E., and Barney, H. L., "Control Methods Used in a Study of the Vowels." *Journal of the Acoustical Society of America*, Vol. 24 (March, 1952), pp. 175–184.

Magnetic Fields in Small Ferrite Bodies with Applications to Microwave Cavities Containing Such Bodies*

A. D. BERK† AND B. A. LENGYEL†, SENIOR MEMBER, IRE

Summary—**The microwave magnetic field in a small ferrite sphere and thin circular cylinder is found in first approximation. In a circularly polarized exciting field the internal field is again circularly polarized. The ratio of the internal field to the exciting field is $3(\mu\pm\alpha+2)^{-1}$ for the sphere and $2(\mu\pm\alpha+1)^{-1}$ for the cylinder. When the exciting field is linearly polarized the internal field is elliptically polarized. The expressions derived are applied to the calculation of the detuning and change of Q of microwave resonators containing ferrite spheres, cylinders and discs. Conversely they provide a means for the calculation of the elements of the permeability tensor from the experimentally observable change in cavity characteristics. The ferromagnetic resonant frequencies calculated from the present formulas are in agreement with those obtained by Kittel by the use of demagnetizing factors.**

INTRODUCTION

MICROWAVE propagation in ferrites placed in an orienting steady magnetic field has been the subject of many recent investigations. The distinctive macroscopic property of ferrites is the tensor character of their permeability. When orienting field is in z direction, and of sufficient magnitude for saturation, intrinsic permeability is described by tensor:

$$\boldsymbol{\mu} = \mu_0 \begin{pmatrix} \mu & -j\alpha & 0 \\ j\alpha & \mu & 0 \\ 0 & 0 & 1 \end{pmatrix}, \tag{1}$$

where μ_0 is the permeability of free space, μ and α are functions of the frequency and of the orienting field.[1] Quantities μ and α are complex, but for frequencies sufficiently far removed from ferromagnetic resonance, their imaginary parts are small. Dielectric constant of a ferrite is a scalar, $\epsilon=\epsilon_0\kappa$. Values of κ of about 10 are common.

Experimental work aimed at the determination of the magnetic properties of ferrites usually consist of the observation of changes in the characteristics of a resonant cavity induced by a small test piece of ferrite placed in the cavity. The object of most investigations utilizing this technique has been the study of ferromagnetic resonance.[2–4] In this paper, however, the emphasis is on the actual computation of the material constants μ and α from observational data.

This problem has interested a number of investigators. Lax and Berk[5] presented formulas for both the real and the imaginary parts of the permeability tensor in terms of the shift in frequency and change in Q of a degenerate cylindrical cavity containing a small sphere of ferrite. An experimental procedure was described by Artman and Tannenwald[6] for the application of these formulas. However, the permeability tensor utilized in both references[5,6] is an "effective" quantity different from the intrinsic permeability tensor of (1). Van Trier[7] developed a method for the measurement of the intrinsic permeability tensor. It utilizes a coaxial cavity with a long thin ferrite cylinder. In order to yield accurate results, this method requires the use of very thin uniform cylinders which are not easy to come by.

Rowen and von Aulock[8] proposed, recently, using thin disks rather than small spheres for samples in a cavity. While their initial results are encouraging, they have overestimated some of the difficulties associated with spherical samples and underestimated some of the difficulties associated with thin disks of large diameter.

In order to explore the relative merits of different configurations and to provide a source of reference for the evaluation of experimental data, we have calculated the shift in resonant frequency and the change of Q of cavities containing ferrites of spherical, cylindrical and disk shapes, in terms of the intrinsic permeability tensor.

An essential step in deriving such expressions, consists of the determination of the rf field within each sample. We shall obtain these internal fields by direct use of field theory—solving a quasi-static equation subject to boundary conditions. Our results agree with those implied in Polder's equations[1] formulated on the basis of demagnetizing factors.

FIELD IN A SPHERE

The simplest problem of the type to be considered is the calculation of the electric and magnetic polarization of a sphere in a uniform static field. When a sphere of

---

* Original manuscript received by the IRE, March 15, 1955; revised manuscript received, July 14, 1955.

† Research Labs., Hughes Aircraft Co., Culver City, Calif.

[1] D. Polder, "On the theory of ferromagnetic resonance," *Phil. Mag.*, vol. 40, pp. 99–115; January, 1949.

[2] H. G. Beljers, "Measurements on gyromagnetic resonance of a ferrite," *Physica*, vol. 14, pp. 629–641; February, 1949.

[3] W. A. Yager and others, "Ferromagnetic resonance in nickel ferrite," *Phys. Rev.*, vol. 80, pp. 744–748; November, 1950.

[4] H. G. Beljers and J. L. Snoek, "Gyromagnetic phenomena occurring within ferrites," *Philips Tech. Rev.*, vol. 11, pp. 313–322; May, 1950.

[5] B. Lax and A. D. Berk, "Cavities with complex media," 1953 IRE CONVENTION RECORD, Part 10, "Microwaves," pp. 65–73.

[6] J. O. Artman and P. E. Tannenwald, "Measurement of permeability tensor in ferrites," *Phys. Rev.*, vol. 91, pp. 1014–1015; August, 1953.

[7] A. A. Th. M. Van Trier, "Guided electromagnetic waves in anistropic media," *Appl. Sci. Res.*, B 3, pp. 305–371; 1953.

[8] J. H. Rowen and W. von Aulock, "Measurement of the complex tensor permeability of ferrites," *Phys. Rev.*, vol. 96, pp. 1151–1153; November, 1954.

permeability $\mu_0\kappa_m$ is placed in a uniform magnetic field $\boldsymbol{H}_0$, it is well-known that the field within the sphere will be uniform and equal to $3H_0/(\kappa_m+2)$, while outside there will be a dipole field added to $\boldsymbol{H}_0$, with the dipole located at the center of the sphere.

This result will be approximately valid for a sphere in a nonuniform, or even time-varying field, provided that the sphere is so small that in its immediate neighborhood the applied field may be regarded as uniform and in the same phase.

Once this quasi-static approach is adopted, the electric and magnetic field problems are separated and we may confine ourselves to the latter. It is thus required to determine the diffraction of a uniform, quasi-static field by a ferrite sphere. It is clear from the form of $\boldsymbol{\mu}$ that the response of the ferrite body to an incident field directed along the z axis is the same as that of an isotropic sphere of permeability μ_0, therefore, only the effect of an incident field in the xy plane is of interest. The x axis will then be chosen parallel to the incident field which will be denoted by H_0e_x, where H_0 is the magnitude of the magnetic field and e_x is the unit vector in the x direction. The field $\boldsymbol{H}$ to be determined must thus reduce to H_0e_x for large distances r, its tangential component must be continuous for $r=a$, the radius of the sphere; moreover, $\boldsymbol{B}=\boldsymbol{\mu}\cdot\boldsymbol{H}$ must be solenoidal and $\boldsymbol{n}\cdot\boldsymbol{B}$, the normal component of $\boldsymbol{B}$ on the surface, must be continuous.

The quasi-static nature of the problem allows us to let $\boldsymbol{H}=\text{grad}\ \psi$. The potential ψ must be continuous everywhere, it must have first and second derivatives except for $r=a$, and for large r it should reduce to H_0x. In view of the solenoidal character of $\boldsymbol{B}$

$$\nabla^2\psi=0, \quad \text{for } r>a, \tag{2}$$

$$\text{div}\ (\boldsymbol{\mu}\cdot\text{grad}\ \psi)=\mu\nabla^2\psi+(1-\mu)\frac{\partial^2\psi}{\partial z^2}=0, \quad \text{for } r<a. \tag{3}$$

The continuity of $\boldsymbol{n}\cdot\boldsymbol{B}$ on the sphere requires that

$$\boldsymbol{n}\cdot(\mu_0\ \text{grad}\ \psi)_+ = \boldsymbol{n}\cdot(\boldsymbol{\mu}\cdot\text{grad}\ \psi)_-, \tag{4}$$

where the subscripts + and − indicate external and internal limits at the surface. Since the permeability tensor in spherical coordinates is

$$\boldsymbol{\mu}=\mu_0\begin{pmatrix} 1+(\mu-1)\sin^2\theta & (\mu-1)\sin\theta\cos\theta & -j\alpha\sin\theta \\ (\mu-1)\sin\theta\cos\theta & 1+(\mu-1)\cos^2\theta & -j\alpha\cos\theta \\ j\alpha\sin\theta & j\alpha\cos\theta & \mu \end{pmatrix},$$

(4) takes the form:

$$\left(\frac{\partial\psi}{\partial r}\right)_+=[1+(\mu-1)\sin^2\theta]\left(\frac{\partial\psi}{\partial r}\right)_- \\ +(\mu-1)\frac{\sin\theta\cos\theta}{a}\left(\frac{\partial\psi}{\partial\theta}\right)_- -j\frac{\alpha}{a}\left(\frac{\partial\psi}{\partial\phi}\right)_-. \tag{5}$$

All the preceding conditions can be satisfied by the solution (suggested by the isotropic static problem):

$$\psi=\begin{Bmatrix} H_0x+D_1\dfrac{x}{r^3}+D_2\dfrac{y}{r^3}, & \text{for } r>a \\ A_1x+A_2y, & \text{for } r<a \end{Bmatrix}, \tag{6}$$

provided

$$\begin{aligned} D_1 &= (A_1-H_0)a^3; \quad D_2 = A_2a^3, \\ A_1 &= 3H_0(\mu+2)[(\mu+2)^2-\alpha^2]^{-1}; \\ A_2 &= -3j\alpha H_0[(\mu+2)^2-\alpha^2]^{-1}. \end{aligned} \tag{7}$$

The internal magnetic field is thus

$$\boldsymbol{H}_- = A_1e_x + A_2e_y. \tag{8}$$

Because of the appearance of j in A_2, the x and y components of the field will be in time quadrature. Within the sphere the field will be uniform and elliptically polarized; outside the sphere there will be two perpendicular dipole fields in time-quadrature added to the original field e_xH_0. Note that the H field turned out to be solenoidal in the ferrite. This is a consequence of the simplicity of the field, for, in general,

$$\text{div}\ \boldsymbol{H} = j\frac{\alpha}{\mu}(\text{curl}\ \boldsymbol{H})_z+\frac{\mu-1}{\mu}\frac{\partial H_z}{\partial z}. \tag{9}$$

While a linearly-polarized external field was shown to excite an elliptically-polarized one in the ferrite, it is easy to show by superposition that a circularly-polarized external field $H_0(e_x\pm j\,e_y)$ excites a circularly-polarized field within the ferrite, which is given by

$$\boldsymbol{H}_- = \frac{3H_0(e_x\pm j\,e_y)}{\mu\pm\alpha+2}. \tag{10}$$

The fields in a cavity are, of course, neither static nor uniform so that (8) and (10) are only approximations. From the classical problem of the diffraction of a plane wave by an isotropic sphere, one can show that

1. If the plane wave is traveling the static solution is a zeroth order approximation in (ka), k being the propagation constant, a, the radius of the sphere, whereas
2. If the plane wave is standing and the sphere is located at a maximum of the field, the static solution is a first order approximation in (ka).

It is intuitively clear the preceding statements prevail for anisotropic spheres also. Hence, keeping in mind the standing-wave character of cavity fields, one may conclude that the terms neglected in (10) are those in $(ka)^2$ and higher orders.

FIELD IN A CYLINDER

The case of a long, thin cylinder parallel to the z axis can be treated similarly. Considering the linearly polarized case first, we have, instead of (5),

$$\left(\frac{\partial\psi}{\partial r}\right)_+ = \mu\left(\frac{\partial\psi}{\partial r}\right)_- - j\frac{\alpha}{a}\left(\frac{\partial\psi}{\partial\phi}\right)_-, \tag{11}$$

and the potential on the outside becomes

$$\psi_+ = H_0 x + \frac{D_1' x}{r^2} + \frac{D_2' y}{r^2}, \tag{12}$$

while the form of the field within the cylinder is the same as in the spherical case. The coefficients A_1 and A_2 become

$$A_1' = \frac{2(\mu + 1)H_0}{(\mu + 1)^2 - \alpha^2}, \quad A_2' = \frac{-j2\alpha H_0}{(\mu + 1)^2 - \alpha^2}, \tag{13}$$

furthermore,

$$D_1' = (A_1' - H_0)a^2, \quad D_2' = A_2' a^2.$$

When the applied field is circularly polarized, we have

$$H_- = \frac{2H_0(e_x \pm j\, e_y)}{\mu \pm \alpha + 1}. \tag{14}$$

FERRITES IN CAVITIES

One may readily show that the change in the resonant frequency of a cavity, due to the introduction of a small sample of material, is given by[9]

$$\omega - \omega_0 = j\frac{\int J_m \cdot H_0^* dv + \int J_e \cdot E_0^* dv}{\mu_0 \int H \cdot H_0^* dv + \epsilon_0 \int E \cdot E_0^* dv}, \tag{15}$$

where $J_e = j\omega(\epsilon - \epsilon_0)E$ and $J_m = j\omega(\mathfrak{y} - \mu_0) \cdot H$ are the electric and magnetic polarization current densities, E_0, H_0 and ω_0 are the unperturbed fields and frequency of the cavity, E, H and ω are the similar quantities in the presence of the material sample and ϵ, $\mathfrak{y}$ are characteristics of the sample. The integrals are over the volume of the cavity. While the denominator of (15) may be replaced, for small perturbations, by $2\mu_0\int|H_0|^2 dv$, it is necessary to know the internal fields E and H for the evaluation of the numerator. For cases of practical interest, approximate expressions for these fields were obtained in the preceding sections.

Spherical Samples

We shall first consider cylindrical cavities (not necessarily circular) with spherical samples. In a practical case, the ferrite sphere is usually placed at a point where the electric field is zero, thus, $J_e = 0$. If, at this point, the unperturbed magnetic field is circularly polarized in the xy plane, we have $H_0 = H_m(e_x \pm j\, e_y)$, and the internal field H is to be computed by means of (10). For sufficiently small samples, the numerator of (15) can be replaced by the product of v, the volume of the sample, and the integrand

$$J_m \cdot H_0^* = 2j\omega\mu_0 |H_m|^2 \frac{3(\mu - 1 \pm \alpha)}{\mu + 2 \pm \alpha}. \tag{16}$$

The relative frequency shift is thus

$$\frac{\Delta\omega}{\omega} = -\frac{|H_m|^2 v}{\int_v |H_0|^2 dv}\,\frac{3(\mu - 1 \pm \alpha)}{\mu + 2 \pm \alpha} = -f\,\frac{3(\mu - 1 \pm \alpha)}{\mu + 2 \pm \alpha}, \tag{17}$$

where f is a constant of the cavity geometry.

Consider now a cylindrical cavity of length h with the axis parallel to the orienting field. If this cylinder has sufficient symmetry, it will permit TE modes with a circularly-polarized magnetic field at some points on the axis. One may show then that

$$f = q\,\frac{\beta^2}{k_0^2}\,\frac{v}{V}, \tag{18}$$

where $k_0^2 = \omega_0^2\mu_0\epsilon_0$, $\beta = n\pi/h$, n is an integer, V the volume of the cavity, q is a factor depending on the shape of the cross section. The situation is typified by cylinders of square and circular cross sections.

For a TE_{11n} mode of a circular cylinder

$$k_0^2 = \beta^2 + \left(\frac{\chi}{a}\right)^2, \quad q = [2(\chi^2 - 1)J_0^2(\chi)]^{-1} \simeq 2.08, \tag{19}$$

where a is the radius, $\chi = 1.84$, the first root of $J_1' = 0$. For a resonator of square cross section and with a mode consisting of the degenerate, TE_{01n} and TE_{10n} modes in time quadrature

$$k_0^2 = \left(\frac{n\pi}{h}\right)^2 + \left(\frac{\pi}{a}\right)^2, \quad q = 2, \tag{20}$$

where a is the side of the square cross section.

When losses are present μ, α and ω become complex: $\mu = \mu' - j\mu''$; $\alpha = \alpha' - j\alpha''$; $\omega = \omega' + j\omega''$. Separating (17) into real and imaginary parts and assuming small losses, one obtains for the real frequency shift

$$\frac{\Delta\omega}{\omega} = \frac{\omega' - \omega_0}{\omega'} = -f\,\frac{3(\mu' - 1 \pm \alpha')}{\mu' + 2 \pm \alpha'}, \tag{21}$$

while the $1/Q$ of the cavity increases by

$$\Delta\frac{1}{Q} = 2\,\frac{\omega''}{\omega'} = 18\,\frac{\mu'' \pm \alpha''}{(\mu' + 2 \pm \alpha')^2}\,f. \tag{22}$$

In the case of a nondegenerate cavity with a linearly-polarized unperturbed magnetic field $H_m e_x$ at the spherical sample the internal field must be calculated from (8). Then,

$$J_m \cdot H_0^* = \frac{3j\omega\mu_0[(\mu - 1)(\mu + 2) - \alpha^2]}{(\mu + 2)^2 - \alpha^2}|H_m|^2, \tag{23}$$

and the frequency shift is

$$\frac{\Delta\omega}{\omega} = -\frac{3}{2}\,\frac{|H_m|^2 v}{\int |H_0|^2 dv}\,\frac{(\mu - 1)(\mu + 2) - \alpha^2}{(\mu + 2)^2 - \alpha^2}. \tag{24}$$

---

[9] *E.g.*, H. B. G. Casimir, "On the theory of electromagnetic waves in resonant cavities," *Philips Res. Rep.*, vol. 6, pp. 162–182; 1951.

Eq. (17), being a simpler expression than (24), indicates the advantage of using a circularly-polarized applied magnetic field at the sample.

Disc Samples

When the sphere of the preceding example is replaced by a thin disc whose *diameter is small* compared to that of the cavity and whose axis is perpendicular to the circularly-polarized rf magnetic field, the internal magnetic field equals the external field, (16) is replaced by

$$J_m \cdot H_0^* = 2j\omega\mu_0 \left| H_0 \right|^2 (\mu - 1 \pm \alpha) \tag{25}$$

and the relative frequency shift is

$$\frac{\Delta\omega}{\omega} = -(\mu - 1 \pm \alpha) f, \tag{26}$$

where the factor f has already been defined.

Cylindrical Samples

The case of a symmetrical rectangular cavity with a thin circular cylindrical post of ferrite placed along the axis of the cavity as shown in Fig. 1, is also of interest.

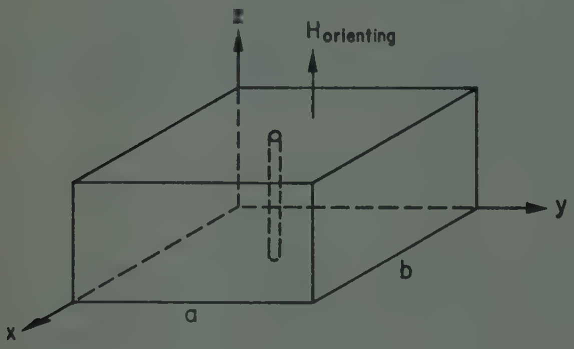


Fig. 1—Degenerate rectangular cavity with a circular ferrite post.

The circularly-polarized unperturbed magnetic field along the ferrite may be produced by superposing the TM_{120} and TM_{210} modes in time quadrature so that the electric field in the cavity is

$$E_0 = e_z \left(\sin \frac{2\pi x}{a} \sin \frac{\pi y}{a} - j \sin \frac{\pi x}{a} \sin \frac{2\pi y}{a} \right).$$

If (15) is applied to this case with the internal field calculated from (14), the frequency shift is

$$\frac{\Delta\omega}{\omega} = -\frac{16}{5} \frac{s}{a^2} \frac{\mu - 1 \pm \alpha}{\mu + 1 \pm \alpha}, \tag{27}$$

where s is the circular cross-sectional area of the ferrite.

In the more general case when the cavity is nondegenerate and the unperturbed field is linearly polarized

$$\frac{\Delta\omega}{\omega} = -\frac{\left| H_m \right|^2 v}{\int \left| H_0 \right|^2 dv} \frac{(\mu - 1)(\mu + 1) - \alpha^2}{(\mu + 1)^2 - \alpha^2}. \tag{28}$$

Discussion: Some remarks on the merits of spherical and disc-shaped samples are in order. Rowen and von Aulock[8] gave the following expression for the frequency shift caused by a spherical sample of ferrite:

$$2 \frac{\Delta\omega}{\omega} = \frac{(\mu - 1)(\mu + 2) - \alpha^2}{(\mu + 2)^2 - \alpha^2} C_1 \pm \frac{\alpha C_2}{(\mu + 2)^2 - \alpha^2}, \tag{29}$$

where C_1 and C_2 are constants of the geometry. According to our calculations, these constants are related, $C_2 = 3C_1$, no matter what the cross section of the cavity. As a consequence, (29) reduces to (17). Some of the disadvantages attributed to spherical samples by Rowen and von Aulock were probably overestimated, since their conclusions were based on (29) instead of the simpler (17). As we have already shown for moderate losses, one can readily separate the real and imaginary parts of the latter equation. Rowen and von Aulock give a two constant formula for disk-shaped samples also.[10] Here again, only one constant is necessary. We believe that the frequency perturbation formulas are applicable only to discs whose diameter is small compared to cavity dimensions because the disk should be restricted to a small area at the center of the cylinder base where the field is circularly polarized. Thus, the choice is to be made between a small sphere and a small disc rather than between a small sphere and a disc of arbitrarily large diameter. When $\mu + \alpha$ is small, say less than five, reasonably accurate determination may be made by means of a sphere. For larger values of $\mu + \alpha$ the frequency variation in (21) becomes quite insensitive to a change in $\mu + \alpha$. In this case, the disc shaped sample may be preferred in spite of the greater difficulty involved in making a sample.

One final word about the location of the sample. Experimentally, it would seem to be most convenient to place the sphere at the center of the bottom of the cavity. If this were done, the condition requiring homogeneity of the magnetic field around the sphere would be violated. The disturbing effect of the walls has been known for some time and has recently been commented on by Spencer and Le Craw.[11] While the use of a hemisphere in place of a sphere permits one to circumvent this difficulty, it is usually more convenient to support spherical samples in a nodal plane of the electric field away from the end walls.

FERROMAGNETIC RESONANCE

If losses are neglected, μ and α of (1), as given by Polder[1] are

$$\mu = 1 + \frac{\gamma^2 M_z H_z^i}{\gamma^2 H_z^{i^2} - \omega^2}; \quad \alpha = \frac{\omega\gamma M_z}{\gamma^2 H_z^{i^2} - \omega^2}, \tag{30}$$

---

[10] Casimir, *op. cit.*, eq. (3).

[11] E. G. Spencer and R. C. Le Craw, "Wall effects on microwave measurements of ferrite spheres," *Jour. Appl. Phys.*, vol. 26, pp. 250–251; February, 1955.

where H_z^i is the internal orienting field (the steady field actually operating on the electrons), M_z is the z component of the magnetization and γ is the magnetomechanical ratio. In view of the denominator of μ and α, ferromagnetic resonance might be expected to occur at $\omega=\gamma H_z^i$. However, the directly measurable resonance of such quantities as the field intensity or the magnetic flux density does not occur at $\omega=\gamma H_z^i$. In the case of a sphere, for example, the field intensity, obtained by substituting (30) in (10), is given by

$$H_- = \frac{\gamma H_z^i \pm \omega}{\gamma H_z \pm \omega}(e_x \mp j\, e_y)H_0. \qquad (31)$$

Ferromagnetic resonance occurs, therefore, at $\omega=\gamma H_z$ where H_z is the external value of the orienting field. Similarly, ferromagnetic resonance of the ferrite cylinder considered in a previous section occurs at $\omega=\gamma(H_z+\frac{1}{2}M_z)$, and not at $\omega=\gamma H_z^i=\gamma H_z$ as it might be expected from (30). Thus, whether one utilizes Polder's permeability tensor and solves the quasi-static boundary value problem, as it is done in this paper, or follows Kittel's treatment[12] involving demagnetizing factors, one obtains the same expressions for the ferromagnetic resonance.

---

[12] C. Kittel, "On the theory of ferromagnetic resonance absorption," *Phys. Rev.*, vol. 73, pp. 155–161; January, 1948.

On the Principle and Design of a Trigger Circuit of a Signal-Seeking Radio Using "Difference-Voltage"*

CHIH CHI HSU†, ASSOCIATE, IRE

***Summary*—The principle and design of the trigger circuit of a signal-seeking radio using the "difference-voltage" of an IF transformer is described in this paper. The "difference-voltage" is first expressed in a mathematical form, from which the "crossover points" can be found. Constant anticipation can be obtained if this "difference-voltage" is used as a trigger pulse to stop the seeking action. The amount of anticipation is related with the mixing index *n* and parameters of the IF transformer and it can be expressed in a simple form. The effect of the avc delay voltage in the described circuit does not affect the amount of anticipation. It only affects the proper trigger level. "Error-asymmetry" and the utilization of the property of detuning the output IF transformer in unidirectional seeker are discussed. Besides the error due to the improper trigger level, there are errors due to the nonlinearity of the tuner. This results in the so-called "error spread." Formulas for the amount of anticipation desired in terms of the tuner sweep characteristics and the stopping time are given. The design of the IF transformer with respect to errors due to components tolerances is fully discussed. Approximate formulas are derived for the error variations.**

INTRODUCTION

SIGNAL-SEEKING radios have two additional circuits beside other conventional radio circuits. They are (1) the seeking circuit and (2) the trigger circuit. The seeking circuit initiates the seeking action when the operator desires and stops when the trigger circuit orders so. The trigger circuit will issue such a command when a signal is reached. The seeking circuit usually consists of a relay with multiple contacts, a group of mechanical gears, cams, and switches, etc., and a mover, in the form of either a dc or an ac motor, or an electromagnet, or some energy-storing devices, such as springs, or some other transducers. In this paper, however, we will only deal with the trigger circuit, particularly a trigger circuit using the principle of the "difference-voltage." The difference-voltage between the secondary and primary voltages of the IF output transformer as the trigger pulse has the theoretical advantage of a sharper pulse than secondary voltage alone, and a constant anticipation regardless of the signal strength. A qualitative description of how the difference-voltage works has been given in the earlier literature[1] but no quantitive details were given. Section I of this paper will take up the quantitative details and formularize the results so that they can be used as a guide for future design. It will be assumed first that a linear tuner is used. The effect of a nonlinear tuner will be taken up in Section II, along with the proper choice of the amount of anticipation. In Section III, design considerations of the output IF transformer in a signal-seeking radio with respect to errors due to components tolerances will be explored.

I. ON THE DIFFERENCE-VOLTAGE, CROSSOVER POINT, TRIGGER LEVEL AND THE PRELIMINARY DESIGN OF THE TRIGGER CIRCUIT OF A SIGNAL-SEEKING RADIO USING DIFFERENCE-VOLTAGE

A. Difference-Voltage and Crossover Points

Fig. 1 (next page) shows IF output transformer and associated circuits. With the exception of grounding

---

* Original manuscript received by the IRE, June 6, 1955; revised manuscript received, August 16, 1955. This paper is based upon three reports written by the author at Bendix Radio Division, Bendix Aviation Corp., Baltimore, Md.

† Bendix Radio Division, Bendix Aviation Corp., Baltimore, Md.

[1] J. H. Guyton, "A signal-seeking automobile receiver," *Electronics*, vol. 26, pp. 154–158; May, 1953.

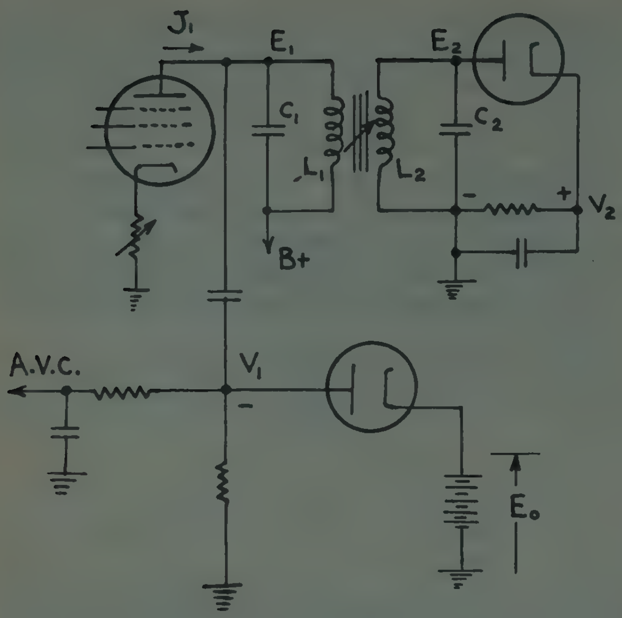


Fig. 1

point of the secondary detector diode, it is a very conventional one. If V_1 and V_2 are the magnitude of the rectified dc voltages due to the carriers (for simplicity we neglect the effect of modulation) of the primary and secondary of the output IF transformer respectively, then the difference-voltage is defined as

$$V_2 - nV_1, \tag{1}$$

where n (the mixing index) is a constant.

If the avc delay voltage $E_0 = 0$, then both V_1 and V_2 will be very close to the magnitude of their peak ac voltages E_1 and E_2, respectively. Hence we have

$$V_2 - nV_1 = E_2 - nE_1. \tag{2}$$

Both E_1 and E_2 are frequency dependent. For high Q cases, they can be expressed as follows:[2]

$$\frac{E_2}{J_1} = \frac{s\sqrt{R_1R_2}}{[(1+s^2)^2 - 2(s^2 - b/2)v^2 + v^4]^{1/2}} \tag{3}$$

$$\frac{E_1}{J_1} = \frac{R_1(1 + Q_2v^2/Q_1)^{1/2}}{[(1+s^2)^2 - 2(s^2 - b/2)v^2 + v^4]^{1/2}}, \tag{4}$$

where

R_1 = equivalent total loading of the primary,
R_2 = equivalent total loading of the secondary,
J_1 = input current to the IF transformer,
$2\pi f_0 = w_0 = 1/\sqrt{L_1C_1} = 1/\sqrt{L_2C_2}$,
$k = M/\sqrt{L_1L_2}$, the coefficient of coupling,
$s = k\sqrt{Q_1Q_2}$, the coupling index,
$\rho = Q_1/Q_2$, the Q ratio,
$b = \rho + 1/\rho = Q_1/Q_2 + Q_2/Q_1$,
$v = \sqrt{Q_1Q_2}(w/w_0 - w_0/w)$, the frequency variable.
E_1 = the primary voltage,
E_2 = the secondary voltage.

The expression for the Difference-Voltage will be

$$E_2 - nE_1 = J_1\left[\frac{s\sqrt{R_1R_2} - nR_1\sqrt{1+v^2Q_2/Q_1}}{[(1+s^2)^2 - 2(s^2 - b/2)v^2 + v^4]^{1/2}}\right]. \tag{5}$$

Such an expression is difficult to visualize. However, it is useful. Fig. 2 is an actual photo of the primary, secondary and the Difference-voltage of a particular circuit. It is obvious difference-voltage in Fig. 2 can be obtained from sketches as shown in Fig. 3 (opposite).

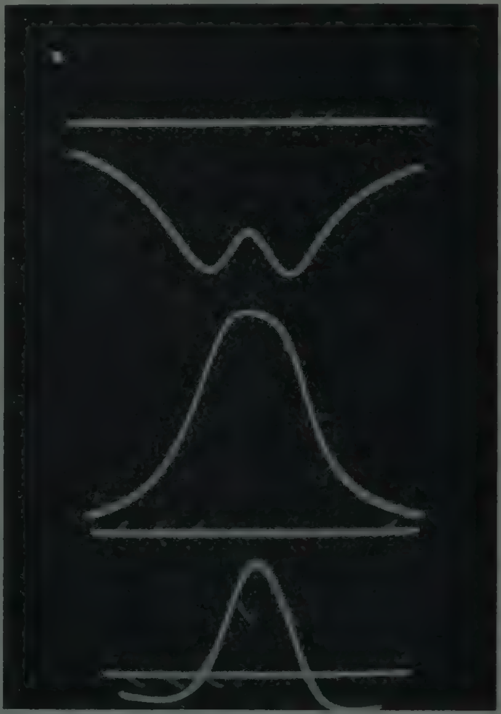


Fig. 2—From top to bottom; primary, secondary, and difference voltages.

The single peaked secondary voltage as shown in Fig. 2 may become double peaked if the coupling is too tight. The primary response is usually double peaked but under certain conditions it may also be a single peaked one. But in any event, the secondary response is more selective (narrow) than the primary response.

The Crossover points are the points at which $E_2 = nE_1$, such as the points a and b in Fig. 3. As the input signal strength changes, the secondary response will increase and decrease with the primary response in the same proportion. Hence the crossover points will move up and down with the secondary response as signal strength varies, but not along the frequency axis as in Fig. 4(a) (opposite). The points at which the difference-voltage crosses over the zero axis as shown in Fig. 4(b) will therefore always be the same. If the trigger level of the stopping circuit is set at those crossover points, constant anticipation will be obtained independent of the signal strength. The amount of anticipation is the difference between the frequency of the crossover point and the center frequency f_0.

---

[2] G. E. Valley, Jr., and H. Wallman, "Vacuum tube amplifiers," MIT Rad. Lab. Ser., No. 18, McGraw-Hill Book Co., Inc., New York, N. Y., pp. 202–210; 1948.

The frequency at which the crossover point occurs can be obtained by setting (5) equal to zero, or

$$E_2 - nE_1 = 0. \tag{6}$$

Then

$$s\sqrt{R_1R_2} - nR_1\sqrt{1 + v^2Q_2/Q_1} = 0. \tag{7}$$

This can be reduced to

$$v = \sqrt{\frac{s^2}{n^2}\frac{C_1}{C_2} - \frac{Q_1}{Q_2}} \tag{8}$$

or

$$\Delta f = \frac{f_0}{2\sqrt{Q_1Q_2}}\sqrt{\frac{s^2C_1}{n^2C_2} - \frac{Q_1}{Q_2}}. \tag{9}$$

If the trigger level is set at the crossover point then Δf will be the amount of anticipation.

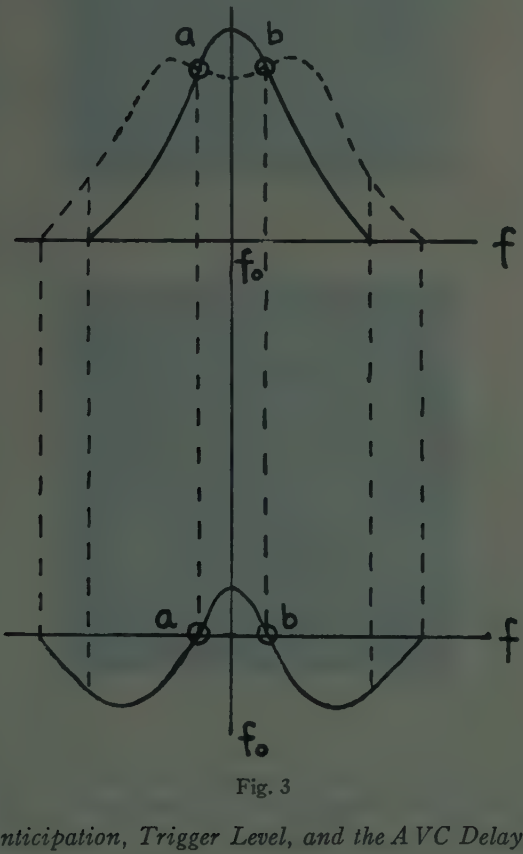


Fig. 3

B. Anticipation, Trigger Level, and the AVC Delay Voltage

So far we have assumed that the primary avc delay voltage $E_0=0$. If $E_0 \neq 0$, then $E_1 \neq V_1$. Instead, we have

$$V_1 = 0, \qquad \text{when } E_1 \leqq E_0 \tag{10}$$

$$V_1 = E_1 - E_0, \qquad \text{when } E_1 \geqq E_0. \tag{11}$$

The difference-voltage will be

$$V_2 - nV_1 = E_2, \qquad \text{when } E_1 \leqq E_0 \tag{12}$$

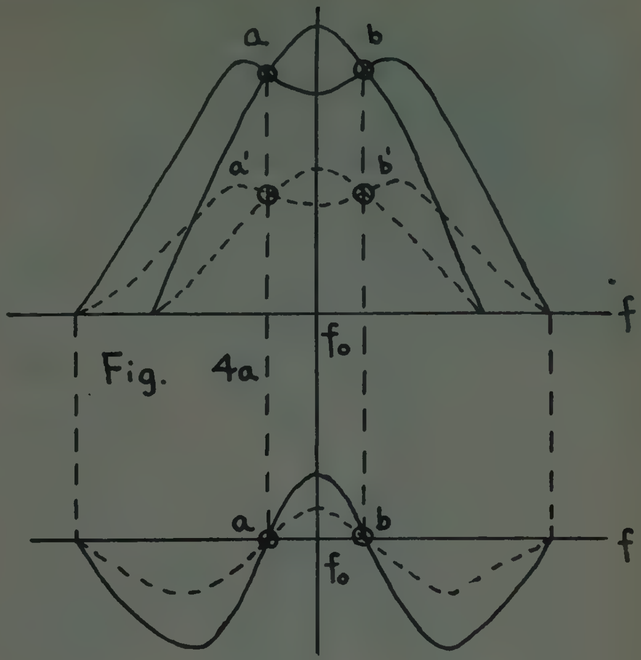


Fig. 4

$$V_2 - nV_1 = E_2 - n(E_1 - E_0), \qquad \text{when } E_1 \geqq E_0. \tag{13}$$

From (13) we have:

$$V_2 - nV_1 = (E_2 - nE_1) + nE_0, \qquad \text{where } E_1 \geqq E_0. \tag{14}$$

Eq. (12) is easy to interpert. It merely says that when the avc delay voltage is not exceeded, the difference-voltage is simply the secondary voltage. Eq. (14), however, is not easy to visualize immediately. If we compare (14) with (2), we find that the only difference is the constant term nE_0. If we set

$$E_2 - nE_1 = 0, \tag{6}$$

then (14) becomes

$$V_2 - nV_1 = nE_0 = \text{constant}. \tag{15}$$

Since E_2 and E_1 increase and decrease together, if equation (6) is true for one signal strength, it will be true for all signal strength. Hence equation (15) will also be true for all signal strength as long as $E_1 \geqq E_0$. In other words, when the delay voltage is exceeded, there will be crossover points. The crossover points will be at a constant level nE_0. If the trigger level of the stopping circuit is set at nE_0, then the anticipation will be independent of the signal strength when $E_1 \geqq E_0$.

Fig. 5 (next page) illustrates the above conclusion. Fig. 5(a) shows that the effect of the avc delay is the same as shifting the primary voltage curve downward by an amount of nE_0. The difference-voltage in the region of interest is shown in Fig. 5(b). The effect of the avc delay voltage shifts the difference-voltage upward by an amount of nE_0. Fig. 5(c) shows the difference-voltage at two different signal strengths. Notice that the difference-voltages without avc delay crossover

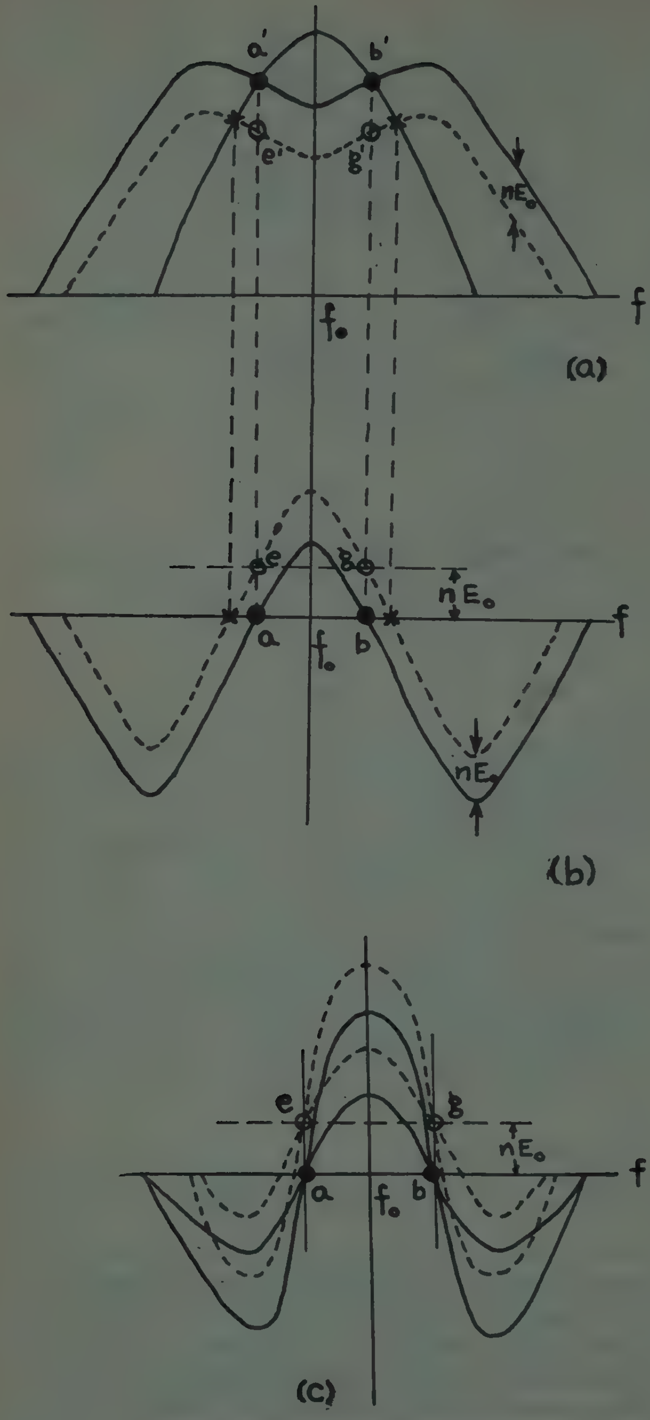


Fig. 5—Solid line: without avc delay. Broken line: with avc delay.

at points a and b, while with avc delay, they cross over at points e and g.

It is evident here that the crossover points in which we are interested are the points at which the difference-voltages at different signal strength cross over one another. It is not necessarily the point at which the difference-voltage crosses over the zero axis. In the case of no delay voltage, however, they are the same.

The calculation of anticipation with avc delay voltage is therefore the same as that of the case without avc delay. [Use (9).]

Fig. 6 and Fig. 7 are photos of the difference-voltages for two different values of the avc delay voltage. The avc delay voltage of Fig. 7 is double that of Fig. 6. It can be seen clearly that the crossover level of Fig. 7 is also double that of Fig. 6. The distances between the two crossover points in each picture are equal. This bears out that the anticipation is not effected by the avc delay voltage.

More discussions on the avc delay voltage will be given later.

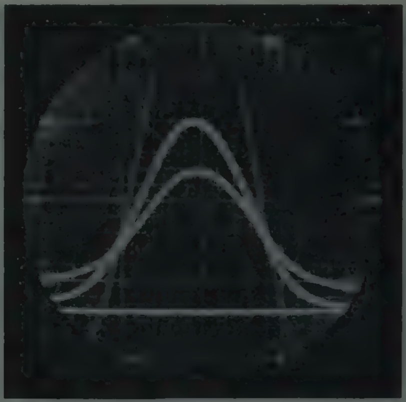


Fig. 6

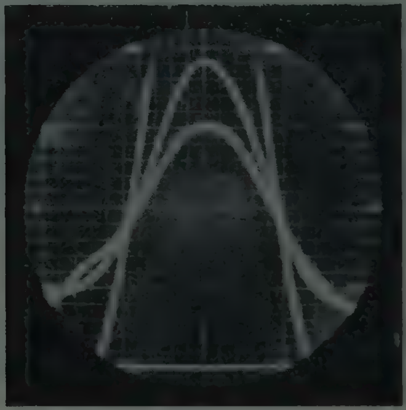


Fig. 7

C. Limitation of Mixing n and the Effect of Selective Circuits Ahead of the Output IF Transformer

Rewriting (9), we have

$$\Delta f = \frac{f_0}{2\sqrt{Q_1 Q_2}} \sqrt{\frac{s^2}{n^2}\frac{C_1}{C_2} - \frac{Q_1}{Q_2}}. \qquad (9)$$

If our output IF transformer is designed according to the performance in the listen position; then f_0, s, C_1, C_2, Q_1 and Q_2 are all fixed. The only variable is the mixing index. It is obvious that there will be no real solution for (9) if the term under the radical sign is less than zero.

In other words, there will be anticipation only if

$$\frac{s^2C_1}{n^2C_2} - \frac{Q_1}{Q_2} > 0, \tag{16}$$

or

$$n^2 < \frac{C_1Q_2}{C_2Q_1} s^2. \tag{17}$$

Since n cannot be negative, hence

$$n < \sqrt{\left(\frac{C_1}{C_2}\right)\left(\frac{Q_2}{Q_1}\right)}\, s, \tag{18}$$

or

$$n < \sqrt{\frac{R_2}{R_1}}\, s. \tag{19}$$

Although (19) is simpler, (18) is more convenient to use. It can be written as:

Mixing Index < $\sqrt{(\text{Step up ratio})(Q \text{ ratio})}$ × Coupling Index

The physical meaning will be even more clear if we notice that

$$\sqrt{\left(\frac{C_1}{C_2}\right)\left(\frac{Q_2}{Q_1}\right)}\, s = \frac{E_2}{E_1}\ {}_{\text{at } f=f_0}. \tag{20}$$

Hence (18) becomes

$$n < (E_2/E_1)_{\text{at } f=f_0},$$

or at $f=f_0$,

$$nE_1 < E_2. \tag{21}$$

Hence there is an upper limit for n, above which there will be no crossover points. Fig. 8 (right) shows the anticipation vs the mixing index for the equal Q case.

What about the lower limit of n? From (9), it will be obvious that the smaller the mixing index n, the larger will be the amount of anticipation. When $n \to 0$, $\Delta f \to \infty$. Such a result is obviously not true. The reason we have such a result is because we have made the assumption that the input is a constant current generator independent of frequency. In the actual case, we will have front end selectivity and the input IF selectivity so that the input to the output IF transformer will be a constant current generator but dependent on frequency. It is therefore obvious that the maximum anticipation will be limited by the bandwidth of stages preceding the output IF transformer. From the standpoint of obtaining as much anticipation as possible, the design of the IF transformers should be such that the input IF transformer should have less selectivity and the output IF transformer should have more selectivity if the overall selectivity is kept the same. This would call for a high Q output IF transformer. However, if the anticipation needed is less than 5 kc or so, a medium Q output IF transformer will be sufficient.

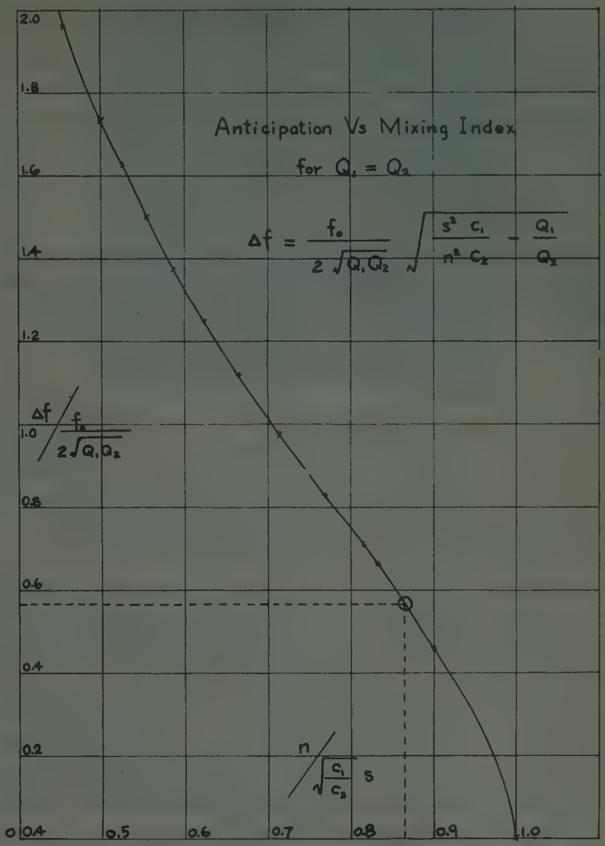


Fig. 8

The effect of the selectivity of the circuits ahead of the IF output transformer on the crossover points of the difference-voltages should be theoretically none, since the crossover points are independent of the signal strength. Of course, it is true only if the frequency of the crossover points are within the maximum anticipation obtainable.

D. The Peak of the Difference-Voltage

The peak of the difference-voltage is a very useful quantity to know. With the peak of the difference-voltage and the crossover points known, we can readily sketch the difference-voltage. The peak of the difference-voltage for zero avc delay voltage can be obtained by setting $v=0$ in (5). If we denote the peak by A, then

$$A = J_1 \frac{s\sqrt{R_1R_2} - nR_1}{1 + s^2}, \tag{22}$$

or simply

$$A = (E_2 - nE_1)_{\text{at } f=f_0}. \tag{23}$$

From (20) and (23) we then have

$$A = \left[s\sqrt{\left(\frac{C_1}{C_2}\right)\left(\frac{Q_2}{Q_1}\right)} - n \right] E_{1\,\text{at } f=f_0}. \tag{24}$$

Eq. (24) is more convenient to use because E_1 at $f=f_0$ can be measured at listen position with great ease.

When the avc delay voltage is not zero, from (14) and (24), the peak A from the zero level will be

$$A = \left[s\sqrt{\left(\frac{C_1}{C_2}\right)\left(\frac{Q_2}{Q_1}\right)} - n \right] E_{1\ \mathrm{at}\ f=f_0} + nE_0. \tag{25}$$

Since nE_0 is the crossover level, hence if the peak of the difference-voltage is measured from the crossover level, regardless of with or without avc delay voltage we will have

$$A_{\text{from the crossover level}} = \left[s\sqrt{\left(\frac{C_1}{C_2}\right)\left(\frac{Q_2}{Q_1}\right)} - n \right] E_{1\ \mathrm{at}\ f=f_0}. \tag{26}$$

From (24) and (26), it can also be shown that

$$A_{\text{from the crossover level}} = s\sqrt{\frac{C_1}{C_2}} \left[\sqrt{\frac{Q_2}{Q_1}} - \frac{1}{\sqrt{\dfrac{4Q_1Q_2(\Delta f)^2}{f_0^2} + \dfrac{Q_1}{Q_2}}} \right] E_{1\ \mathrm{at}\ f=f_0}. \tag{27}$$

For the same output IF transformer, it is obvious from (27) that the smaller the anticipation Δf, the smaller will be the value of A. If the trigger level is not set correctly, this may cause skip of the station.

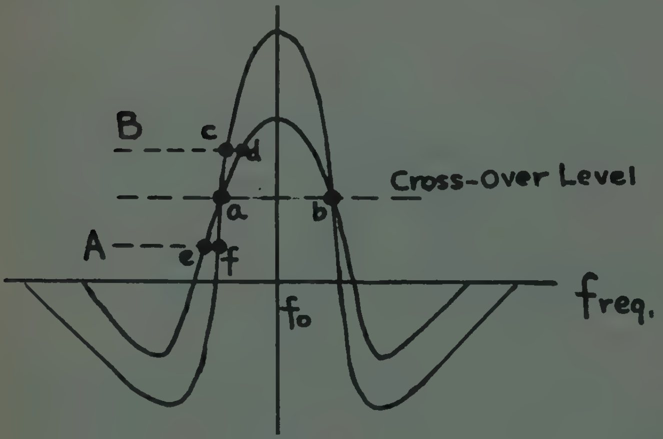


Fig. 9

E. Error Caused by the Trigger Level Variation and Error Asymmetry

The difference-voltage is used to trigger a relay. Amplifiers may be cascaded before the control (or the trigger) tube. The gain of the amplifier should be as to match the trigger level of the control tube to the crossover level of the difference-voltage. If the trigger level does not match the crossover level, error will result. The nature of the error variation caused by the improper trigger level can be seen from the sketch of Fig. 9.

If the gain of the trigger amplifier is too high or the trigger is set at the level A as shown in Fig. 9, then the anticipation will not be constant with respect to the signal strength. It will show the tendency to undershoot. The weaker the signal, the larger the amount of undershoot. If, however, the system is over-shooting at point a (the crossover point) to start with, then the operation at the level A will show an improvement of seeking error. The improvement will, however, depend on the signal strength. On the other hand, if the gain of the trigger amplifier is too low or the trigger level is set at the level B (Fig. 9), the anticipation will again not be a constant with respect to the signal strength. It will show the tendency of over-shoot. The weaker the signal the larger the amount of over-shoot. If the system is over-shooting at point a to start with, then the trigger at the level B will result in more error. If, however, the system is under-shooting at point a to start with, then the trigger level B will show error improvement again. But the amount of improvement will again depend upon the signal strength. The nature of the error variation due to improper trigger level can be utilized to adjust the trigger amplifier gain so that the circuit will be triggered at the crossover level.

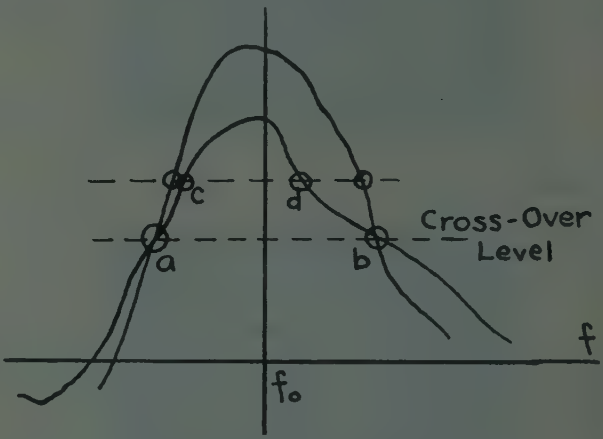


Fig. 10—Point c and point d are not equidistant from the f_0 axis.

If the front end and the input IF transformer are not well aligned, or the front end selectivity is nonsymmetrical with respect to the center frequency in the interested region, then we may not have such nice symmetrical difference-voltage such as shown in Fig. 9. Instead, we may have an asymmetrical difference-voltage such as those shown in Fig. 10. As discussed above, trigger at wrong level will give seeking error. The amount of error depends upon the signal strength. For a given signal strength, the error will be the same whether the signal seeking action is from the high frequency toward the low frequency or the other way, as long as the difference-voltage is symmetrical as shown in Fig. 9. But in the case of Fig. 10, even for the same signal strength, it will produce different error depending on whether it is seeking toward the high-frequency end or the low-frequency end. This we may refer to as error asymmetry.

Error asymmetry also can be caused by misalignment

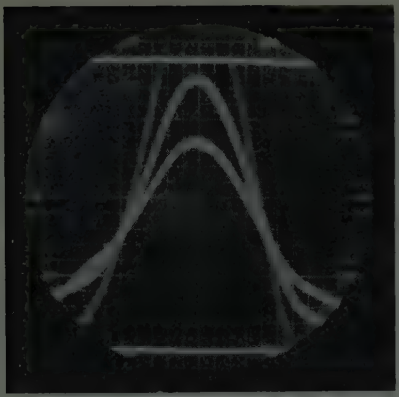


Fig. 11

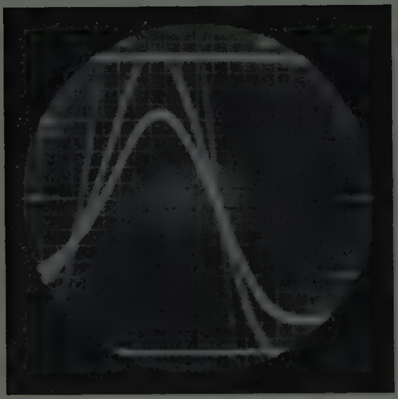


Fig. 12

or detuning of the output IF transformer. Figs. 11, 12 and 13 will clarify this point. Fig. 11 shows a photo of the difference-voltages when the output IF transformer is well aligned. It shows good symmetry. Fig. 12 and Fig. 13 show the detuning effect of the output IF transformer in one way and another. The two crossover points are not at the same level. If the trigger level is set at either one of the two crossover points, the error seeking in one direction may be zero but the error seeking in the other direction will not be zero.

It would be proper to point out here that the Error Asymmetry caused by detuning of the output IF transformer as shown in Fig. 12 and Fig. 13 does not arise as a problem for unidirectional seeking radio. In fact there are two distinct facts indicated by these two photos that detuning the output IF transformer can be used for advantages. The facts are

1. There are still crossover points.
2. The crossover points are shifted to one side or another. Fact one suggests that the same principle can be used for unidirectional signal seeking radio. Fact 2 suggests that we can take advantage of the shifting of the crossover point to get: a) more anticipation than the limit imposed by the front end and input IF transformer selectivity as discussed before, b) less anticipation without too much sacrifice of the peak A. (As previously pointed out in relating with (27), A will

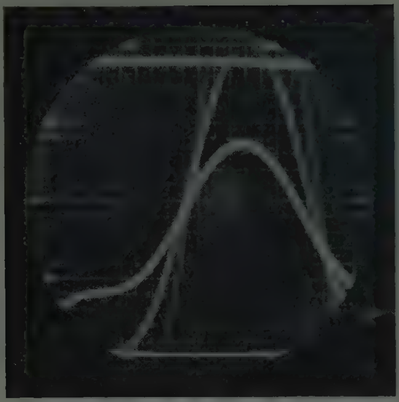


Fig. 13

decrease as anticipation is reduced.) This will give less error due to signal level effect.

For bidirectional signal seeking radio, the shifting of the crossover points will cause errors, unless some other arrangements are used. This will be highly impractical. But that does not mean that a bidirectional signal-seeking radio is worse than a unidirectional one. There are error asymmetries in a bidirectional signal-seeking radio, but they can be reduced to within 0.5 kc or less. On the other hand it does not have the jerky, annoying sound of fly-back that a unidirectional signal seeking radio usually has.

Error asymmetry can also be caused by other reasons such as unequal braking action and others, but they will not be discussed further here.

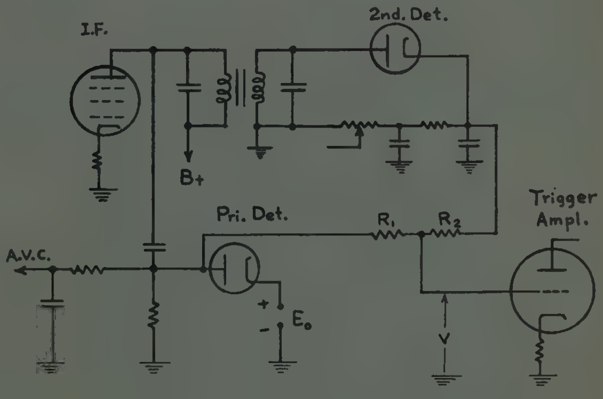


Fig. 14

F. Example: Preliminary Design of a Trigger Circuit of a Signal-Seeking Radio

It is decided to convert a certain model of conventional automobile radio into a signal-seeking radio using the principle of the difference-voltages. There are many possible trigger circuits but a circuit such as that above in Fig. 14 is decided upon. The IF frequency is 265 kc.

1. If an anticipation of 2.5 kc is desired, what should be the ratio R_2 to R_1?
2. What will be the crossover level if the avc delay voltage is six volts?
3. What will be the minimum trigger sensitivity?

4. Sketch the difference-voltages in the neighborhood of the crossover level.

1. The design of the output IF transformer will be discussed in Section III. For the present let us assume that the output IF transformer has the following parameters:

Circuit Q's : $Q_1 = Q_2 = 30$
Capacitances : $C_1 = 114$, $C_2 = 134$
Coupling index: $s = 0.85$

Since the anticipation $\Delta f = 2.5$ kc and $f_0 = 265$ kc, the mixing index n can be calculated from (9). Or we may use the curve on Fig. 8.

$$\frac{\dfrac{\Delta f}{f_0}}{2\sqrt{Q_1 Q_2}} = \frac{(2.5)(2)(30)}{265} = 0.566$$

From Fig. 8 we have

$$\frac{n}{s\sqrt{\dfrac{C_1}{C_2}}} = 0.865$$

But

$$s\sqrt{\frac{C_1}{C_2}} = 0.85\sqrt{\frac{114}{134}} = 0.784.$$

Hence

$$n = (0.865)(0.784) = 0.68.$$

The mixing network used in Fig. 14 is actually an adder network. If R_1 and R_2 are relatively high value resistors, then the loading effect of these resistors on the IF output transformer can be neglected. With good approximation, Fig. 15 can be used to represent the mixing network. If

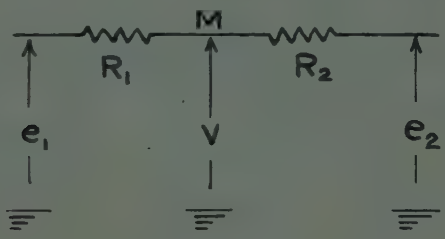


Fig. 15

$$R_2/R_1 = n$$

then

$$V = \frac{1}{1+n}(e_2 + ne_1). \tag{28}$$

Now

$$e_2 = E_2$$
$$e_1 = -(E_1 - E_0),$$

hence

$$V = \frac{1}{1+n}(E_2 - nE_1 + nE_0). \tag{29}$$

Comparing the right side of the equation (29) with that of (14), we find that they are the same except the factor $1/(1+n)$. Hence

$$R_2/R_1 = n = 0.68.$$

If

$$R_1 = 10 \text{ megohms} \quad \text{then} \quad R_2 = 6.8 \text{ megohms}$$

2. The factor $1/(1+n)$ can be included in the gain of the amplifier following the mixing circuit; then the crossover level will still be nE_0. However, if the crossover level is measured at the point M, then

$$\text{crossover level} = \frac{n}{1+n}E_0. \tag{30}$$

If $E_0 = 6$v., $n = 0.68$, The crossover level $= (0.68)(6)/(1+0.68) = 2.43$ v.

3. To find the minimum trigger sensitivity, it is necessary to know the front end gain. The front end gain varies with the signal frequency. However, for a well-designed receiver, the variation in gain is not much. Assume that the receiver has an average front end and IF gain as follows:

$$E_{1\,\text{peak}} = (6.3)(67)(9)(108)(\sqrt{2}E_{\text{antenna effective}})$$

Or

$$E_1 = 590{,}000\ E_{\text{antenna}} \tag{31}$$

Before avc takes over, e_1 in (28) will be zero and (28) becomes

$$V = E_2/(1+n). \tag{32}$$

The minimum trigger sensitivity will be the sensitivity at which, $V = (E_2 \text{ at } f = f_0)/(1+n) = $ crossover level,

or

$$(E_{2\,\text{at}\,f=f_0})/(1+n) = nE_0/(1+n)$$

or

$$E_{2\,\text{at}\,f=f_0} = nE_0 \tag{33}$$

Substitute (20) into (33):

$$\sqrt{\left(\frac{C_1}{C_2}\right)\left(\frac{Q_2}{Q_1}\right)}\, sE_{1\,\text{at}\,f=f_0} = nE_0. \tag{34}$$

Substitute (31) into (34):

$$E_{\text{antenna}} = \frac{nE_0}{\sqrt{\left(\dfrac{C_1}{C_2}\right)\left(\dfrac{Q_2}{Q_1}\right)} \times s \times 590{,}000} \text{ volts,}$$

or

$E_{\text{antenna}} = 8.8$ micro-volts— The minimum trigger sensitivity.

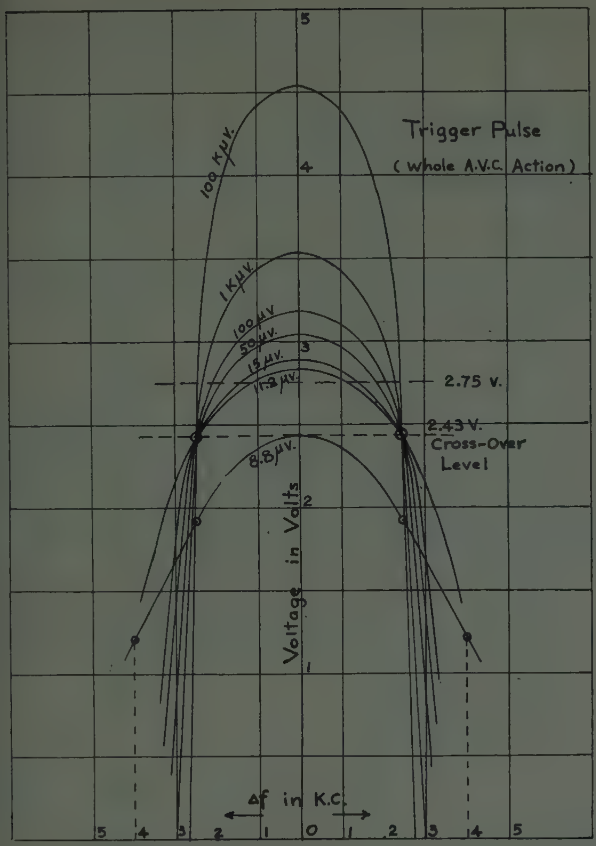


Fig. 16

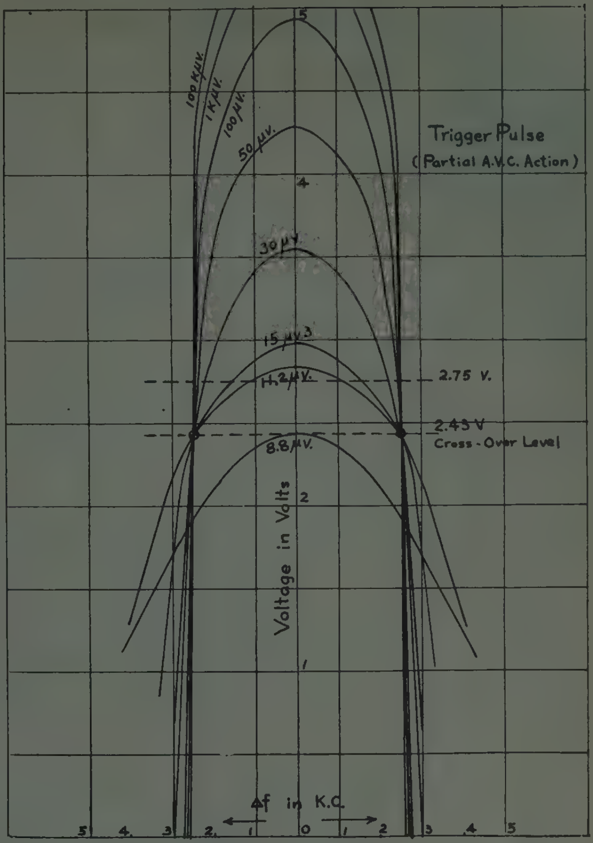


Fig. 17

4. To sketch the difference-voltage, it is necessary to know the selectivity. But for rough sketches, we may assume that the two times down bandwidth is about 8 kc. The difference-voltage for $E_{\text{antenna}} = 8.8$ microvolts can then be sketched, as shown in Fig. 16. At 2.5 kc from the center frequency of this curve, voltage is 1.92 volts. Hence the minimum sensitivity to have crossover point at this point should be approximately:

$$(2.43)(8.8)/1.92 = 11.2 \text{ micro-volts.}$$

The corresponding $E_{1\ \text{at}\ f=f_0}$ will be

$$(0.59)(11.2) = 6.6 \text{ volts.}$$

From (26) and the factor $1/(1+n)$, we have

$$A = \frac{1}{1+n}\left[\sqrt{\left(\frac{C_1}{C_1}\right)\left(\frac{Q_2}{Q_1}\right)}\ s - n\right] E_{1\ (\text{at}\ f=f_0)} + \frac{nE_0}{1+n}. \tag{35}$$

Hence for the present case we have

$$A = 0.062\ E_{1\ (\text{at}\ f=f_0)} + 2.43 \text{ volts.} \tag{36}$$

If the following avc characteristics are assumed: $E_0 = 6$ volts

Input (micro-volts)	15	50	100	1k	100k
E_1 at $f=f_0$ (volts)	8.0	10	12	18	34

Then the peak of the difference-voltages can be computed by using (36):

Input (micro-volts)	15	50	100	1k	100k
A (the peak) (volts)	2.9	3.05	3.18	3.55	4.54

The difference-voltages can then be sketched as shown in Fig. 16. They are based upon the avc characteristics at listen condition. However, at actual seeking condition, the sweep speed may be so fast that the time constant of the avc circuit is relatively large. For example, with sweep speed of 300 kc per second, the time to cover 3 kc is only 10 milliseconds. If the time constant of the avc citcuit is 100 ms, it is obvious that no appreciable avc voltage is reached at time of trigger action; unless there is a very strong signal. Hence we can say that under the seeking condition, avc action is only partial.

There will be no change due to this partial avc action before the avc takes over for the sketches in Fig. 16. At small signal the effect on those sketches is also negligible. Let us assume the following avc characteristics due to this partial avc action:

Input (micro-volts)	15	30	50	100	1k	100k
$E_{1\ \text{at}\ f=f_0}$	9	18	30	40	50	60

Then the peak of the difference-voltages will be

Input (micro-volts)	15	30	50	100	1k	100k
A (the peak) (volts)	2.99	3.54	4.29	4.91	5.43	6.15

The difference-voltages under such conditions are sketched as shown in Fig. 17 (page 1599).

Comparing Fig. 16 and Fig. 17, we notice that the 15 microvolt pulse does not change much but the 50 microvolt pulse has been changed tremendously. Suppose the trigger amplifier gain variation causes the trigger level to be 2.75 volts instead of the crossover level 2.43 volts. Then for 50 microvolts input, it will give an error of approximately 1 kc in the case of Fig. 16, while the error will be negligible in the case of Fig. 17. Hence the partial avc action actually helps the accuracy of the seeking action. But to obtain the accuracy by purposely using longer avc time constant may result in "skip" of weak stations immediately after the strong station. One thing is definitely clear though; that is, the higher the front end sensitivity, the better will be the seeking accuracy.

The sketches shown in Fig. 16 and Fig. 17 are only approximate ones to show that we can roughly get such kind of trigger pulse before we start any experimental work. The actual pulse is more complicated. For instance, due to double-peaked nature of the primary voltage, it is possible that the primary voltage at 11.2 microvolts does exceed the delay voltage at the 2.5 kc off the center frequency as shown in Fig. 16 and Fig. 17, but at the center frequency it may be less than the delay voltage. The result will be a flatter peak near the center frequency than that shown by the sketches at 11.2 microvolts input.

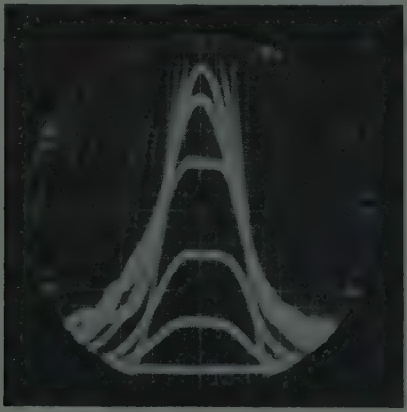


Fig. 18

Fig. 18 is a photo of the difference-voltages. Notice that at very weak signal input, the difference-voltage is the flatter-peak secondary voltage. When the signal is strong, the sharp-peak difference pulse appears. One of the difference-voltages shows that it passes the crossover point but the primary voltage is still not large enough at the center frequency; hence it still has the flat-peak.

II. ON THE "ERROR-SPREAD" AND THE AMOUNT OF ANTICIPATION DESIRED FOR THE DESIGN OF THE TRIGGER CIRCUIT OF A SIGNAL SEEKING RADIO

In Section I of this paper, we have assumed that the tuner is a linear one. However, in actual case, it is not. This will introduce another kind of error which varies over the broadcast band. We will call this "the error-spread over the band" or simply "the error-spread." Section II will discuss this error-spread and the amount of anticipation desired for the design of the trigger circuit of a signal-seeking radio.

A. *The Desired Anticipation for a Linear Tuner*

The anticipation is required because of the lagging of the stopping circuit response. The stopping circuit here includes the circuit associated with the relay, the tuner carriage, the motor or its equivalent, as well as the gear trains between them. If we define that

h = the anticipation in kc
a = sweep speed (in kilocycles per second) of the tuner
t_m = total effective mechanical delay time in millisecond,
θ = the error in kc,

then the error will be

$$\theta = at_m(10)^{-3} - h. \tag{37}$$

Hence, if

$$h < at_m(10)^{-3},$$

we have $\theta > 0$—over-shoot or if $h > at_m(10)^{-3}$, we will have: $\theta < 0$—under-shoot, Therefore, for $\theta = 0$, we only have to choose

$$h = at_m(10)^{-3}. \tag{38}$$

However, the tuner we have in actual case is usually a nonlinear one. The factor a in (38) will therefore not be a constant over the whole broadcast band. Fig. 19 shows a typical tuner characteristic. If t_m is the same, then, it will be obvious that the value of h chosen to satisfy (38) at one frequency of the band will upset the equality at another frequency. This results in the so-called "error-spread over the band." Hence, what is the desired amount of anticipation for the design of the trigger circuit of the signal seeking radio will depend upon not only the total effective mechanical delay time t_m, but also the characteristics of the tuner.

B. *The Total Effective Mechanical Delay Time*

The factor t_m—the total effective mechanical delay time in milliseconds—is not a simple one. The stopping system usually undergoes the following steps of action:

1. Relay contacts open—disconnects the driving source from the motor.
2. Fly-over period—the motor is coasting on its mechanical inertia.
3. Relay contacts closed—braking is applied to the motor.

Suppose we have specified that the relay vendors should supply a relay in our circuit and that the time

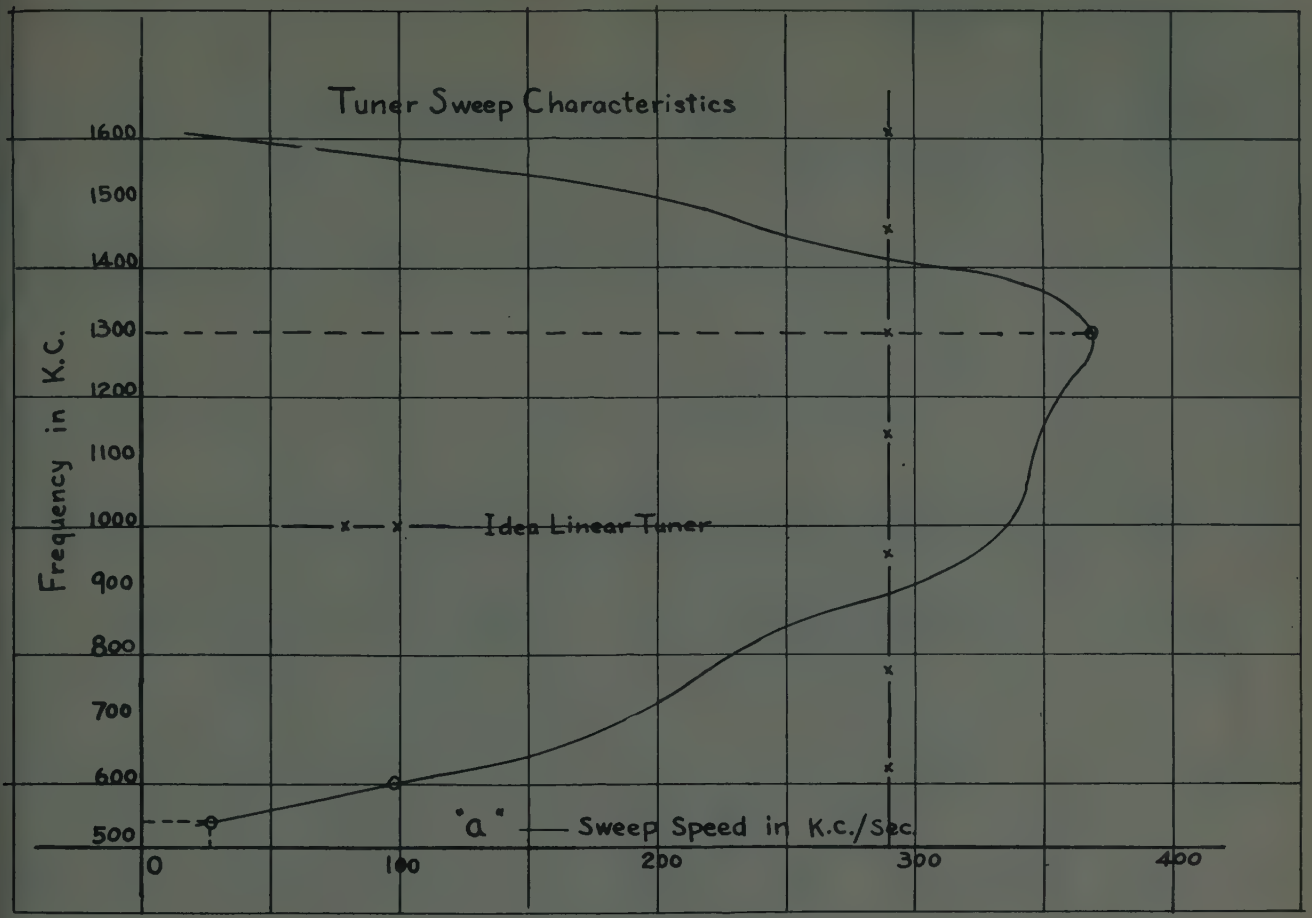


Fig. 19

from the commanding of the trigger action to the end of the fly-over period be t_1 (say for example 5 milliseconds), then we have:

t_m = relay opening time t_1 + effective motor stopping time t_2 (39)

The effective motor stopping time is not the actual motor stopping time. During the motor stopping period, the speed of the motor changes. Before the braking is applied, we assume that the speed change is not large. But after the braking is applied the speed of the motor will change at a very fast rate. Hence, although we may use the relay opening time in (39) for approximation, we cannot use the actual motor stopping time after braking is applied. This actual time must be converted into the effective motor stopping time.

If the actual motor stopping time after braking is in terms of the number of revolutions the motor coasts between the instant when the braking is applied and the instant when the motor is completely at standstill, the calculation of the effective motor stopping time will be easier. Suppose the motor stops in p revolutions which corresponds to q inches movement of the tuner carriage, and the tuner sweep speed during the seeking is $1/r$ inches per second, then the effective motor stopping time in milliseconds will be

$$t_2 = qr(10)^3 \tag{40}$$

or

$$t_2 = dpr(10)^3, \tag{41}$$

where d is the conversion factor including the gear train ratio in inches of the carriage movement per revolution of the motor.

Substituting (41) into (39), we have

$$t_m = t_1 + dpr(10)^3. \tag{42}$$

As an example: if $t_1 = 5$ ms and if the motor stops within 2/3 of a revolution after the braking is applied, then we have $p = 2/3$. If $d = 0.001$ inch per 0.6 revolution, $r = 6$ seconds per inch, then $t_2 = dpr(10)^3 = (2/3)(0.001/0.6)(6)(10)^3 = 6.7$ ms. Hence

$$t_m = t_1 + t_2 = 5 + 6.7 = 11.7 \text{ m.s.} \tag{43}$$

C. *Error-Spread Due to Nonlinear Tuner*

Substituting (42) into (37), we have

$$\theta = a(t_1 + dpr(10)^3)(10)^{-3} - h. \tag{44}$$

Since t_m does not depend upon electrical characteristic of tuner over band, it will be a constant once t_1, p, d, and r are fixed. If we rewrite (37) into the form

$$\theta = -h + at_m(10)^{-3}, \tag{45}$$

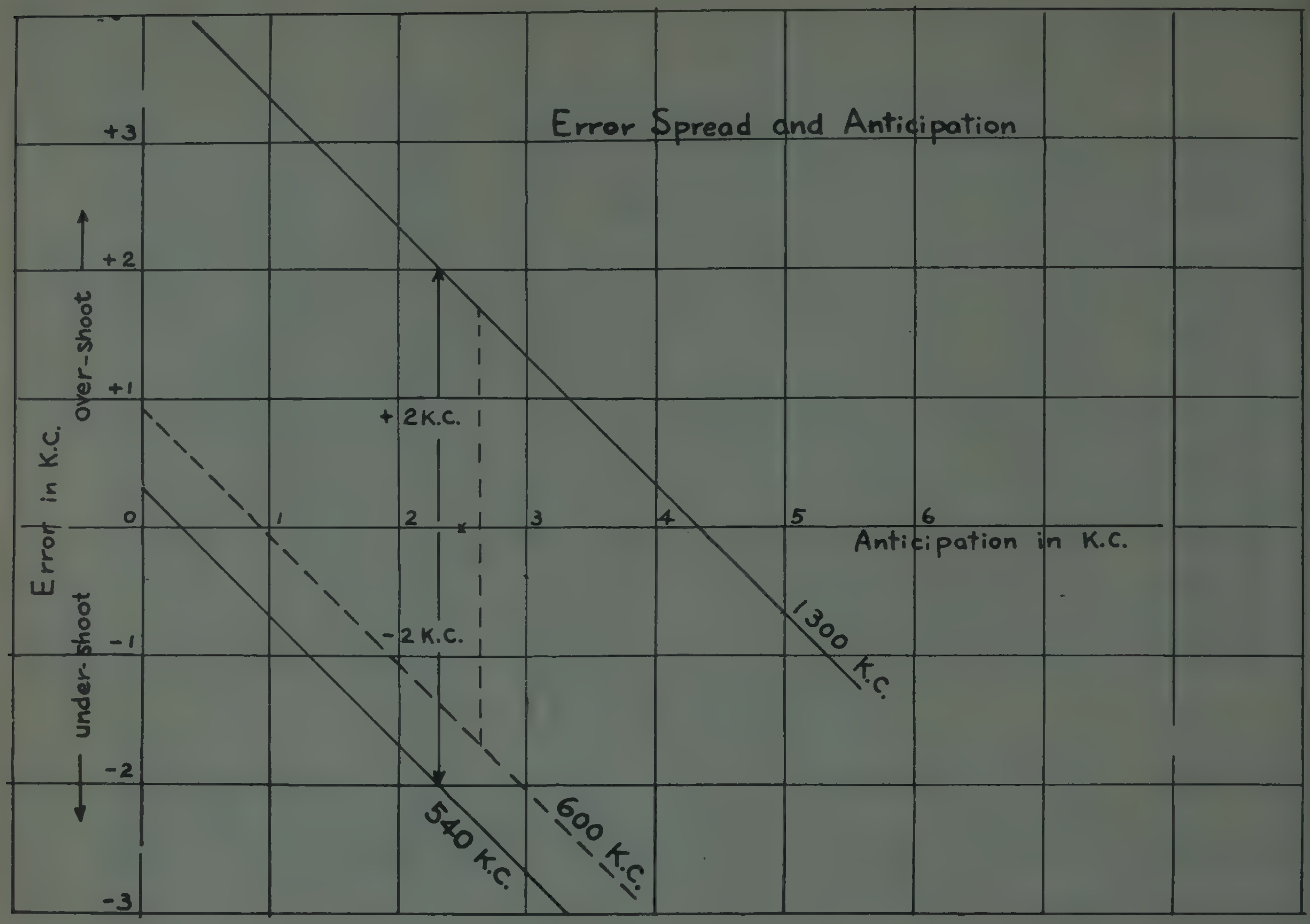


Fig. 20

then at any particular frequency in the band where the factor a will be a fixed value, the plot of θ versus h will be a straight line. For the error over the band we will have a family of straight lines with a as a parameter. The slope of those lines is negative unity.

If the tuner has a nonlinear characteristic as shown in Fig. 19, then the two boundary cases for the tuner will be at 540 kc and 1,300 kc respectively. The factor a will have the following values:

At 540 kc, $a =$ 26.6 kilocycles per second

At 1,300 kc, $a =$ 370 kilocycles per second.

If the stopping circuit gives total effective mechanical delay time t_m, 11.7 ms as shown by (43), then at 540 kc,

$$\theta = -h + (26.6)(11.7)(10)^{-3}; \tag{46}$$

at 1,300 kc,

$$\theta = -h + (370)(11.7)(10)^{-3}. \tag{47}$$

The plot of (46) and (47) is shown in Fig. 20 (above). It is obvious that if amount of anticipation is 2.3 kc, error-spread will be ±2 kc (a total error-spread at 4 kc). Hence the assumption of 2.5 kc for anticipation in the example of Section I is adequate.

D. Analytical Expression for the Desired Anticipation and the Error-Spread

From (37), we have

$$\theta_1 = -h + a_1 t_m (10)^{-3} \tag{48}$$

$$\theta_2 = -h + a_2 t_m (10)^{-3}, \tag{49}$$

where the subscripts 1 and 2 indicate the two extreme cases of the nonlinear tuner. Let us also assume that a_1 be greater than a_2, then for the same amount of anticipation, the case of (48) will be easier to over-shoot than the case of (49). If it is desired that

$$\theta_1 = -b\theta_2, \tag{50}$$

where b can be any constant, then, we have

$$-h + a_1 t_m (10)^{-3} = -b(-h + a_2 t_m (10)^{-3}). \tag{51}$$

After simplification, we have

$$h = \frac{(a_1 + ba_2)}{(1 + b)} t_m (10)^{-3}. \tag{52}$$

Substitute (52) into (49) and (48):

$$\theta_1 = \frac{b}{1 + b} (a_1 - a_2) t_m (10)^{-3} \tag{53}$$

$$\theta_2 = \frac{-1}{1+b}(a_1 - a_2)t_m(10)^{-3}. \tag{54}$$

The total error-spread will be $\theta_1 - \theta_2$, hence

$$\text{total error-spread} = (a_1 - a_2)t_m(10)^{-3}. \tag{55}$$

Notice that the total error-spread is independent of the value of b. If $b=1$, that is if we wish that the over-shoot and the under-shoot of the error-spread be equal, then the proper anticipation should be

$$h = \frac{(a_1 + a_2)}{2} t_m(10)^{-3}. \tag{56}$$

The error-spread will be

$$\pm \frac{a_1 - a_2}{2} t_m(10)^{-3}. \tag{57}$$

III. Design Considerations of the Output IF Transformer of a Signal-Seeking Radio with Respect to Errors due to Components Tolerances

In the example of Section I of this paper, the circuit Q's of the IF output transformer are assumed to be 30. This corresponds to a coil Q of 50 in a typical set. IF transformer with Q of that range is relatively cheap. From the standpoint of seeking error variation, high Q output IF transformer will be more advantageous. But a high Q output IF transformer will require a too low Q input IF transformer if the over-all selectivity is kept the same. This will again cost money. However, if the cost is of secondary interest, then the IF output should be designed with respect to the seeking errors due to components tolerances. If the coupling factor, base capacitors are fixed, then the IF transformer design will be fixed if the Q's of the transformer are known. What kind of Q should we choose? What will be the seeking error caused by the variation of components associated with the output IF transformer? This section is intended to answer these questions. It will offer a way to tell approximately what amount of error we will have once our design is done. We will first assume that there is no Q-variation and then, later on, we will see what will happen when Q varies. Approximations are used wherever possible.

A. Variation of Error When the Amount of Anticipation Desired Is Fixed

Rewrite (9) into

$$f_c = \frac{f_0}{2\sqrt{Q_1Q_2}} \sqrt{\frac{s^2}{n^2}\frac{C_1}{C_2} - \frac{Q_1}{Q_2}}, \tag{58}$$

where f_c is the anticipation in kc, f_0 is the IF frequency, and n is the mixing index, and the rest are the conventional symbols. If we denote

$$u = \sqrt{\frac{s^2}{n^2}\frac{C_1}{C_2} - \frac{Q_1}{Q_2}}. \tag{59}$$

then

$$f_c = \frac{f_0}{2\sqrt{Q_1Q_2}} v. \tag{60}$$

Let us simplify the expression of (59) by defining

$$\frac{s^2}{n^2}\frac{C_1}{C_2} = x^2 \tag{61}$$

and

$$\frac{Q_1}{Q_2} = m^2; \tag{62}$$

then

$$u = \sqrt{x^2 - m^2}. \tag{63}$$

If we let m be a constant, then any percentage variation in s or $\sqrt{C_1/C_2}$ will be equivalent to the variation of x and any percentage variation in n will be equivalent to the variation of $1/x$.

If the variation is not large, we can make the following approximation:

$$\Delta f_c = \frac{df_c}{dx}\Delta x, \tag{64}$$

or

$$\Delta f_c = \frac{df_c}{du}\frac{du}{dx}\Delta x. \tag{65}$$

From (60)

$$\frac{df_c}{du} = \frac{f_0}{2\sqrt{Q_1Q_2}}. \tag{66}$$

From (63),

$$\frac{du}{dx} = \frac{x}{\sqrt{x^2 - m^2}}; \tag{67}$$

hence

$$\Delta f_c = \frac{f_0}{2\sqrt{Q_1Q_2}} \frac{x}{\sqrt{x^2 - m^2}}\Delta x. \tag{68}$$

But from (60),

$$\frac{f_0}{2\sqrt{Q_1Q_2}} = \frac{f_c}{u}; \tag{69}$$

therefore

$$\Delta f_c = \frac{f_c}{u}\frac{x}{\sqrt{x^2 - m^2}}\Delta x. \tag{70}$$

Substituting (63) into (70), we have

$$\frac{\Delta f_c}{f_c} = \frac{x}{x^2 - m^2}\Delta x. \tag{71}$$

If now

$$\Delta x = \pm M\% x.$$

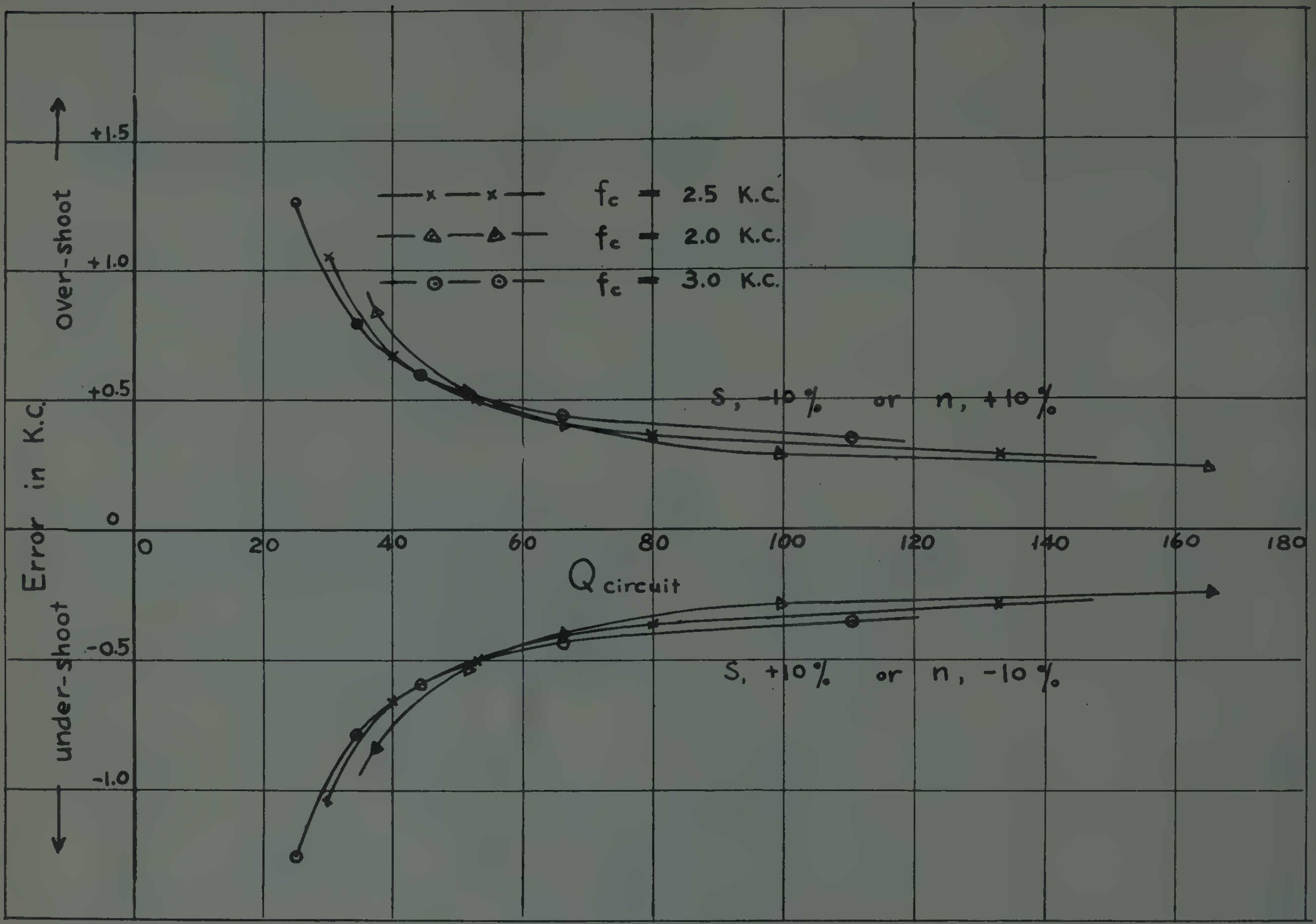


Fig. 21—Calculated error variation with fixed anticipation. For approximation use (76) and (80).

then

$$\frac{\Delta f_c}{\pm M\% f_c} = \frac{x^2}{x^2 - m^2}. \tag{72}$$

From (63) we have

$$v^2 = x^2 - m^2$$

or

$$x = \sqrt{v^2 + m^2}. \tag{73}$$

Hence

$$\frac{\Delta f_c}{\pm M\% f_c} = \frac{v^2 + m^2}{v^2} = 1 + \frac{m^2}{v^2}. \tag{74}$$

If we denote

$$v = \alpha m, \tag{75}$$

then

$$\boxed{\frac{\Delta f_c}{\pm M\% f_c} = 1 + \frac{1}{\alpha^2}}. \tag{76}$$

Substitute (75) into (60),

$$f_c = \frac{f_0}{2\sqrt{Q_1 Q_2}}\,\alpha m. \tag{77}$$

Substitute (62) into (77):

$$f_c = \frac{\alpha f_0}{2\sqrt{Q_1 Q_2}}\sqrt{\frac{Q_1}{Q_2}} = \frac{\alpha f_0}{2\sqrt{Q_2{}^2}}$$

or

$$\boxed{f_c = \frac{\alpha f_0}{2Q_2}}; \tag{78}$$

Hence

$$\boxed{Q_2 = \frac{\alpha}{2}\,\frac{f_0}{f_c}}. \tag{79}$$

From (76) and (79), it is clear that the larger the α the smaller the error, which corresponds to a higher Q_2.

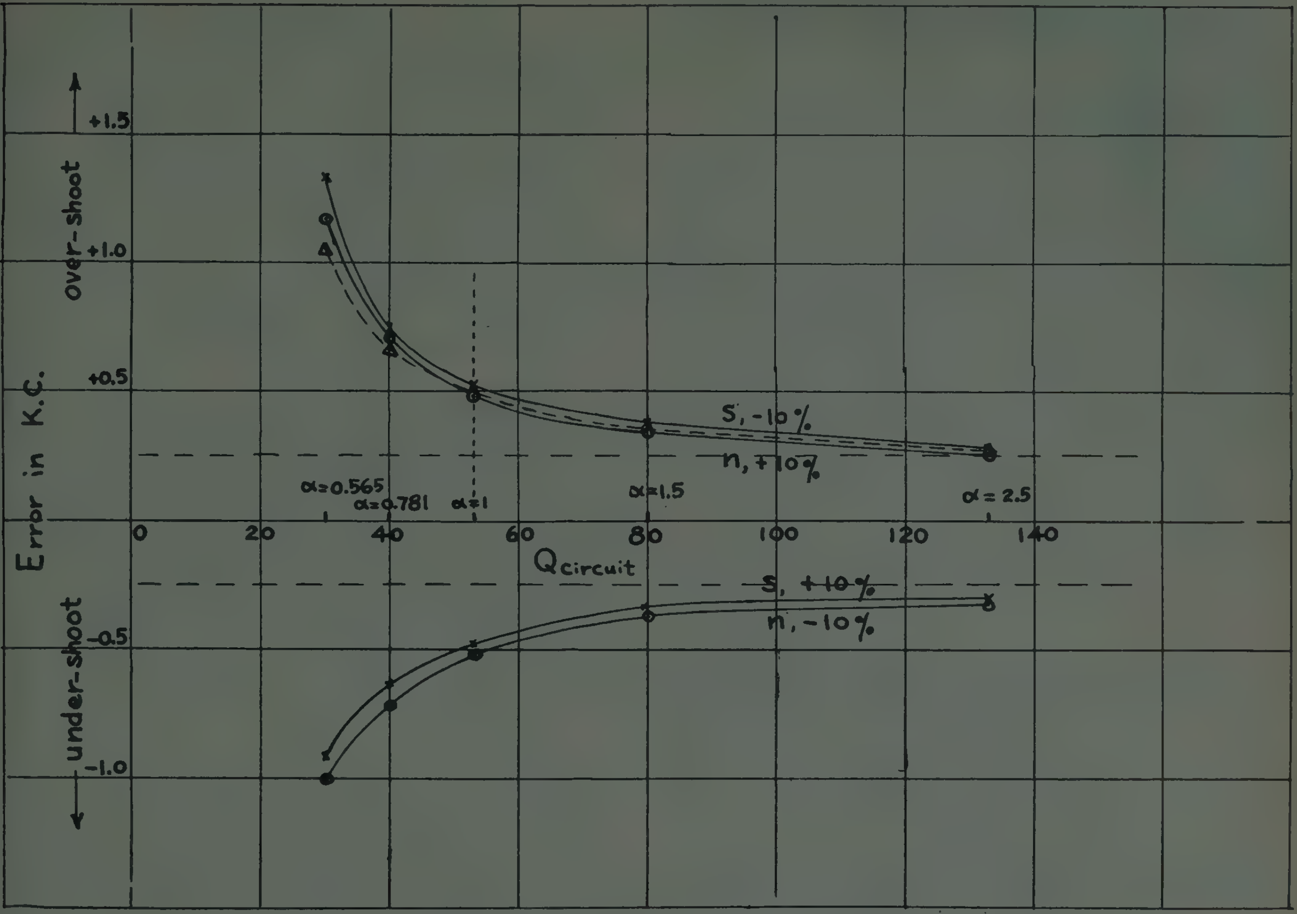


Fig. 22—Error variation with fixed anticipation. $f_c = 2.5$ kc.
– – – △ – – – approximation use (76) and (80).

Eq. (79) can also have another form:

$$\boxed{\alpha = \frac{2Q_2 f_c}{f_0}}. \tag{80}$$

From (80) and (76), the error curve due to different Q_2 can be plotted. If $C_1 = 114$ mmf, $C_2 = 134$ mmf, $s = 0.85$, $f_0 = 265$ kc and $Q_1 = Q_2 = Q$, three sets of curves are shown on Fig. 21 (page 1604) corresponding to $f_c = 2$ kc, $f_c = 2.5$ kc, and $f_c = 3$ kc respectively.

In order to check the accuracy of the above approximation formula, calculations by exact method are used for the case of $f_c = 2.5$ kc and the result is shown in Fig. 22. It shows that in the region of interest, the accuracy is very good.

From the above curves, it is evident that high Q case is better. However, the improvement above $Q = 80$ is not very much. Even at $\alpha = 1$, or $Q = 53$, it is not too far from the ideal minimum.

The result of Δf_c due to $\Delta(1/x)$ can be derived similarly. The final expression is the same except the sign. The details will not be shown here.

B. The effect of Unequal Q

Although the examples given above are for the cases with $Q_1 = Q_2 = Q$, the results apply as well to the unequal Q cases as to the equal Q cases. However, the Q's in Fig. 21 and Fig. 22 should be Q_2 in the unequal Q cases. This is because from (76), for the same amount of $\Delta f_c/(\pm M$ per cent $f_c)$, α has to be the same. From (79), if α is the same, then Q_2 has to be the same. Of course, when $m \neq 1$, the value of n is not the same as the value of n with $m = 1$. Table I, showing results from the exact calculation, should make the point clear.

TABLE I
$f_c = 2.5$ kc, $s = 0.85$

m	Q_1	Q_2	α	n	Error in kc			
					s, +10 per cent	s, −10 per cent	n, +10 per cent	n, −10 per cent
1	80	80	1.5	0.435	−0.34	0.38	0.34	−0.37
2	320	80	1.5	0.216	−0.35	0.37	0.33	−0.38
0.5	20	80	1.5	0.867	−0.34	0.38	0.34	−0.37

It is evident here that there is no advantage for $m > 1$. For $m < 1$ the primary Q can be lowered if the waveform is not disturbed too much due to the misalignment of IF.

C. Error Due to Q-Tolerance and Loading Variation

Both the coil-Q tolerance and the loading variation will change the circuit Q and result in seeking errors. If a set of center-design components are used, and if C_1, C_2, k, and n are all center-design values, then the information about the error due to the deviation of circuit Q's from the center-design values will be valuable.

When Q_1 deviates from the center-design value. From (78), we know that if α and Q_2 are the center-design values, the anticipation will not be changed even when Q_1 is deviated from the center-design value. The point will be more clear if we put k, the coefficient of coupling, into (78). Then it can be shown that

$$f_c = \frac{f_0}{2}\sqrt{\frac{k^2c_1}{n^2c_2} - \frac{1}{Q_2{}^2}}. \tag{81}$$

Since Q_1 does not appear in (81), the deviation of Q_1 from the center-design value will not affect the accuracy of seeking. This result relieves the worry of the possible seeking error by the primary loading variation with the signal strength due to the primary avc loading, provided the detuning effect is negligible.

When Q_2 deviates from the center-design value. If the deviation $\Delta Q_2 = \pm M$ per cent Q_2 is relatively small, then

$$\Delta f_c = \pm\ M \text{ per cent } Q_2(\partial f_c/\partial Q_2). \tag{82}$$

From (81), it can be shown that

$$\partial f_c/\partial Q_2 = (f_0{}^2/4f_c)(1/Q_2{}^3). \tag{83}$$

Hence

$$\Delta f_c = \pm\ M \text{ per cent } (f_0{}^2/4f_c)(1/Q_2{}^2). \tag{84}$$

The error due to the deviation of Q_2 from the center-design value is therefore inversely proportional to the square of Q_2. This result again favors a high Q_2 output IF transformer. If volume control is the load of the transformer secondary, then the tolerance of the volume control specification should be tightened.

The accuracy of (84) depends upon the amount of deviation from the center-design value. For deviation less than 5 per cent it gives very good results. Even with a deviation of 10 per cent, it gives a fairly good approximation. The following results are computed according to (84) for $f_c = 2.5$ kc, $f_0 = 265$ kc, and $\pm$M per cent $= \pm 10$ per cent.

Q_2	30	40	50	60	70	80	100	120
Error in kc	0.78	0.44	0.28	0.2	0.15	0.11	0.07	0.05

It is evident that the improvement above $Q_2 = 60$ is not very much.

CONCLUSIONS

1. The equation for the "difference-voltage" with no avc delay voltage is

$$E_2 - nE_1 = J_1\left[\frac{s\sqrt{R_1R_2} - n\,R_1\sqrt{1 + v^2Q_2/Q_1}}{[(1+s^2)^2 - 2(s^2 - b/2)v^2 + v^4)^{1/2}}\right]. \tag{5}$$

2. The crossover points have a frequency deviation from the center frequency

$$\Delta f = \frac{f_0}{2\sqrt{Q_1Q_2}}\sqrt{\frac{s^2}{n^2}\frac{C_1}{C_2} - \frac{Q_1}{Q_2}}. \tag{9}$$

3. The avc delay effects only the crossover level but not the frequency of the crossover point.

4. If the trigger level of the stopping circuit is adjusted to the same as the crossover level of the trigger circuit, constant frequency anticipation can be obtained for a linear tuner. The amount of anticipation is equal to the frequency deviation of the crossover point.

5. There is an upper limit for the mixing index n, above which there will be no crossover points. The limit is

$$n < \sqrt{\frac{C_1}{C_2}\frac{Q_2}{Q_1}}\,s. \tag{19}$$

6. The maximum amount of anticipation obtainable depends upon the selective characteristics of the circuits ahead of the output IF transformer. Within the maximum anticipation obtainable, the effect of the front end selectivity on the crossover points should be none. However, it may cause error asymmetry if the trigger level is not the crossover level.

7. If the over-all selectivity of the receiver is kept the same, from the standpoint of obtaining as much anticipation as possible, the Q's of the output IF transformer should be high. However, if the anticipation desired is less than 5 kc or so, a medium Q output IF transformer will be sufficient.

8. The crossover level depends upon the avc delay voltage and the mixing index. Or,

$$nE_0 = \text{constant} \tag{15}$$

9. The peak of the difference-voltage from the crossover level is independent of the avc delay voltage once the avc delay voltage is exceeded.

$$A_{\text{from the crossover level}} = \left[s\sqrt{\frac{C_1}{C_2}\frac{Q_2}{Q_1}} - n\right]E_{1\text{ at } f=f_0}. \tag{26}$$

10. The smaller the amount of anticipation, the smaller will be the peak of the difference voltage from the crossover level.

11. The variation of the trigger level will cause "level effect"—the amount of seeking error depends upon the signal strength. The nature of the error variation due to improper trigger level can be utilized to

adjust the trigger amplifier gain so that the circuit will be triggered at the crossover level.

12. "Error Asymmetry" refers to the fact that in a bidirectional signal seeking radio with ideal tuner, the seeking error produced with the same input signal depends upon whether it is seeking toward the high frequency end or the low frequency end of the broadcasting band.

13. Error asymmetry can be caused by the misalignment of the front end, the input IF transformer, and the output IF transformer. It can also be caused by the unequal braking characteristics of the moving system and others.

14. Detuning of the output IF transformer shifts the crossover points. However, we can utilize this property in a unidirectional signal seeking radio to obtain

(a) more anticipation than the limit imposed upon by the front end and the input IF transformer selectivity.

(b) less anticipation without too much sacrifice of the peak of the difference-voltage from the crossover level.

15. High front end gain during seeking is desired for a signal seeking radio to reduce the seeking error due to the level effect.

16. The partial avc action helps the seeking accuracy. Hence long time constant for the avc circuit is desirable. But if it is too long, it may result in "skip" of weak stations immediately after the strong station.

17. Error-spread over the broadcast band is due to the nonlinear characteristic of the tuner system. To reduce the error-spread, the tuner sweeping characteristic should be made as linear as possible (i.e., the sweeping rate in kilocycles per second should be a constant throughout the broadcast band). This can be done either by a proper design of the tuner coil or a variable speed drive such that the resultant tuner sweeping characteristic is the one desired.

18. The faster the stopping circuit and the stopping action, the less the amount of anticipation required, and the less will be the error-spread.

19. If a_1 and a_2 ($a_1 > a_2$) are the two extreme sweep speed in kc per second of the tuner, the total error-spread will be:

$$(a_1 - a_2)t_m(10)^{-3}. \tag{55}$$

20. The shifting of error-spread depends upon the amount of anticipation.

$$h = \frac{(a_1 + ba_2)}{1 + b} t_m(10)^{-3}, \tag{52}$$

where the errors at the two extreme frequencies are related by

$$\theta_1 = -b\theta_2. \tag{50}$$

21. If Q's are constants and if the ±M per cent variation of $\sqrt{C_1/C_2}$, s and n are not very large, the seeking error will be approximately

$$\Delta f_c/(\pm M \text{ per cent } f_c) = 1 + 1/\alpha^2, \tag{76}$$

where

$$\alpha = 2Q_2 f_c/f_0. \tag{80}$$

Hence for small error, high Q_2 output IF transformer will be required.

22. As long as Q_2 is the same,

(a) $Q_1 < Q_2$ does not give less error due to the per cent variation of C_1/C_2, s and n than the case with $Q_1 = Q_2$. (Although it does give a larger difference-voltage, but it may give more asymmetry for the same amount of misalignment.)

(b) There is no advantage for $Q_1 > Q_2$.

23. If a set of center-design components are used and if C_1, C_2, k, n are all center-design values, then the deviation of Q_1 from the center-design value does not affect the seeking accuracy.

24. However, when Q_2 is deviated from the center-design value, there will be seeking error. If the deviation is not large, the error will be approximately:

$$\Delta f_c = \pm M \text{ per cent } (f_0^2/4f_c)(1/Q_2^2). \tag{84}$$

25. It is evident from the results that some errors are positive while others are negative. It is therefore possible to use the error caused by one kind of component variation to compensate for the errors caused by other kinds of component variations.

26. In the example given, it will be more expensive to either:

(a) tighten the IF transformer tolerance and the volume control tolerance specifications,

(b) have high-coil-Q IF transformer, or

(c) to have special variable coupling IF transformer.

Hence to pick different mixing resistors for compensation of the tolerances of the IF and other associated components will be more practical and cheaper.

27. To utilize the maximum secondary coil Q of the IF output transformer, reflex detector may be used provided that the distortion is tolerable.

ACKNOWLEDGMENTS

The author wishes to express his appreciation to Messrs. G. W. Randolph, C. S. Lerch, Jr., B. Hooten, J. F. Slack and other members of the signal-seeking radio development group at Bendix Radio for their cooperation. The author is particularly indebted to Mr. F. E. Churchill for his numerous laboratory check-ups and discussions.

IRE Standards on Graphical and Letter Symbols for Feedback Control Systems, 1955*

COMMITTEE PERSONNEL

Committee on Feedback Control Systems, 1952–1955

W. M. Pease, *Chairman*, 1952–1954

J. E. Ward, *Chairman*, 1954–1955

M. R. Aaron
G. S. Axelby
G. A. Biernson
R. E. Graham
V. B. Haas
R. J. Kochenburger
D. P. Lindorff
W. K. Linvill
D. L. Lippitt
J. C. Lozier
T. Kemp Maples
W. M. Pease
E. A. Sabin
P. Travers
J. E. Ward
R. B. Wilcox
S. B. Williams
F. R. Zatlin

Standards Committee, 1955–1956

E. Weber, *Chairman*

M. W. Baldwin, Jr., *Vice-Chairman*

R. F. Shea, *Vice-Chairman*

L. G. Cumming, *Vice-Chairman*

J. Avins
W. R. Bennett
J. G. Brainerd
P. S. Carter
P. S. Christaldi
A. G. Clavier
J. E. Eiselein
A. W. Friend
V. M. Graham
R. A. Hackbusch
H. C. Hardy
P. J. Herbst
Hans Jaffe
Henry Jasik
A. G. Jensen
J. L. Jones
J. G. Kreer, Jr.
E. A. Laport
A. A. Macdonald
Wayne Mason
D. E. Maxwell
K. R. McConnell
H. R. Mimno
M. G. Morgan
G. A. Morton
H. L. Owens
P. A. Redhead
C. H. Page
R. Serrell
R. M. Showers
H. R. Terhune
J. E. Ward
W. T. Wintringham

Measurements Co-ordinator

R. F. Shea

I. Introduction

1.1 Standardization of symbols is considered important for the exposition of feedback control concepts. The purpose is to establish forms for representing letter symbols and graphical symbols used in block diagrams.

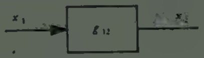
In the preparation of this standard, it was found that there was no complete and self-consistent set of symbols in use that appeared to fulfill the requirements of the IRE. It was also found that there is a wide variation in the symbols used by different industries and professional societies so that it is difficult to choose symbols with a universal acceptance in all fields. Therefore, a compromise has been made among existing symbols used in the electrical field.

---

* Reprints of this Standard, 55 IRE 26.S1, may be purchased while available from The Institute of Radio Engineers, 1 East 79 Street, New York 21, N. Y., at $0.25 per copy. A 20 per cent discount will be allowed for 100 or more copies mailed to one address.

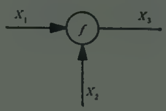
II. Graphical Symbols for Block Diagrams

2.1 *Transfer Element*



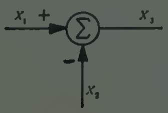
2.1.1 A transfer element represents the functional relationships (g_{12}) between a single input signal (x_1) and a single output signal (x_2), in which the input signal, indicated by the arrow, is the independent variable.

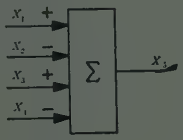
2.2 *Mixing Point*



2.2.1 The indicated relationship is $x_3=f(x_1, x_2)$.

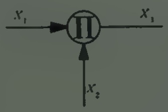
2.3 *Summing Point*





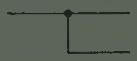
2.3.1 The indicated relationships are $x_3=x_1-x_2$ and $x_5=x_1-x_2+x_3-x_4$. A summing point is a special case of the mixing point and indicates the algebraic addition of two or more signals to produce one output signal. An algebraic sign should be indicated at the arrowhead for each signal to be added. If the number of input signals to be added is large the rectangular symbol should be used.

2.4 *Multiplication Point*

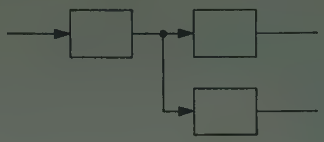


2.4.1 The indicated relationship is $x_3=x_1x_2$. A multiplication point is a special case of the mixing point.

2.5 *Branch Point*



2.5.1 A branch point, which indicates that a signal is distributed to two or more points in a block diagram is represented by a heavy dot. Example:



2.6 Graphical symbols added to a block diagram for mathematical purposes shall be shown dotted to indicate that they do not represent components of the physical system.

III. Standard for Letter Symbols

3.1 *Essential Features of the System of Symbols*

3.1.1 *Signals*

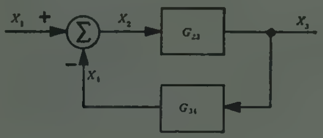
Signals are represented by a single letter symbol with a single subscript denoting its physical or mathematical meaning. The letter x has been chosen as the preferred symbol for generalized signals. Lower case represents the time domain. Upper case represents the complex frequency domain.

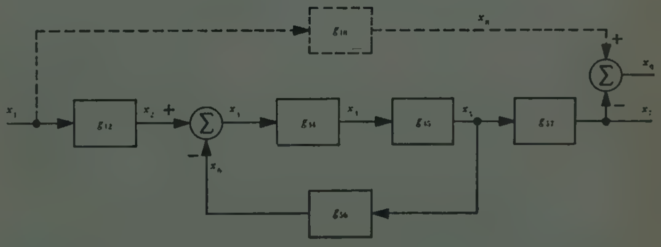
3.2 *Transfer Functions*

Transfer functions are represented by a single letter symbol with a double subscript, the first letter or number of which is the subscript of the symbol for the input signal and the second of which is the subscript of the symbol for the output signal. The symbol g has been chosen. Lower case represents the time domain. Upper case represents the complex frequency domain.

IV. Examples

4.1 Application of the standard graphical symbols and the standard form for letter symbols are illustrated in the typical block diagrams below:





* * *

IRE Standards on Pulses: Methods of Measurement of Pulse Quantities, 1955[*]

COMMITTEE PERSONNEL

Subcommittee on Pulse Modulated Transmitters

H. Goldberg, *Chairman*

Ross Bateman
L. L. Bonham
W. F. Cook
H. Kohler
G. F. Montgomery
A. E. Newlon
W. K. Roberts
B. D. Smith

Committee on Radio Transmitters, 1953–1955

P. J. Herbst, *Chairman*
H. Goldberg, *Vice-Chairman*

T. E. Ahlstedt
J. Battison
T. J. Boerner
M. R. Briggs
A. Brown
H. R. Butler
W. R. Donsbach
L. K. Findley
T. M. Gluyas, Jr.
J. B. Heffelfinger
H. E. Goldstine
A. E. Kerwien
L. A. Looney
J. F. McDonald
S. M. Morrison
J. Ruston
H. B. Seabrooks
G. W. Sellers
B. Sheffield
N. B. Tharp
I. R. Weir

Standards Committee, 1955–1956

E. Weber, *Chairman*
M. W. Baldwin, Jr., *Vice-Chairman*
R. F. Shea, *Vice-Chairman*
L. G. Cumming, *Vice-Chairman*

J. Avins
W. R. Bennett
J. G. Brainerd
P. S. Carter
P. S. Christaldi
A. G. Clavier
J. E. Eiselein
A. W. Friend
V. M. Graham
R. A. Hackbusch
H. C. Hardy
P. J. Herbst
Hans Jaffe
Henry Jasik
A. G. Jensen
J. L. Jones
J. G. Kreer, Jr.
E. A. Laport
A. A. Macdonald
Wayne Mason
D. E. Maxwell
K. R. McConnell
H. R. Mimno
M. G. Morgan
G. A. Morton
H. L. Owens
P. A. Redhead
C. H. Page
R. Serrell
R. M. Showers
H. R. Terhune
J. E. Ward
W. T. Wintringham

Measurements Co-ordinator

R. F. Shea

I. Introduction

1.1 Definition of a Pulse (51 IRE 20. S1)

A pulse is defined as "a variation of a quantity whose value is normally constant; this variation is characterized by a rise and a decay, and has a finite duration.

Note 1: The word 'pulse' normally refers to a variation in time; when the variation is in some other dimension, it shall be so specified, such as 'space pulse.'

Note 2: This definition is broad so that it covers almost any transient phenomenon. Features common to all 'pulses' are rise, finite duration, and decay. It is necessary that the rise, duration, and decay be of a quantity that is constant (not necessarily zero) for some time before the pulse and has the same constant value for some time afterwards. The quantity has a normally constant value and is perturbed during the pulse. No relative time scale can be assigned."

[*] Reprints of this Standard, 55 IRE 15.S1, may be purchased while available from The Institute of Radio Engineers, 1 East 79 Street, New York 21, N. Y., at $0.60 per copy. A 20 per cent discount will be allowed for 100 or more copies mailed to one address.

1.2 Zero Axis

It is important to realize that since a pulse is defined as a variation of a quantity, the variation is zero at the start and end of the pulse. Therefore, in these standards the graphical representation of the normally constant value will be called the "zero axis" of a pulse.

1.3 Delineation of Pulses

It should be noted that the variation considered to be the pulse may be accompanied by other variations that are not of interest. For example, spikes, overshoots, and polarity reversals may be present, but may be ignored if they are not pertinent to the measurement being taken. The word "pulse" as used in these standards refers to that portion of a waveform delineated as the pulse, after exclusion of those portions of the waveform determined to be nonpertinent. This determination of the nonpertinent portions of a waveform may depend upon the function of the pulse in a particular circuit or system. For example, a negative excursion following a positive pulse may be ignored in the measurement of Pulse Decay Time if it is determined that this negative excursion has no important effect upon the operation of the circuit or system under consideration. The portion of a waveform delineated as pulse may also be determined by a time interval of interest outside of which the waveform is not considered part of the pulse. These standards have been written with as much generality as possible and are applicable to pulses with or without spikes, overshoots, or polarity reversals. Whether or not these are considered part of the pulse is a decision which is left up to the individual user. The delineation of the pulse should be made arbitrarily only if *a priori* knowledge is not available, and in either case the results should be clearly stated.

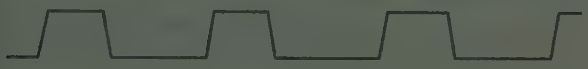
1.4 Definition of a Pulse Train (51 IRE 20. S1)

A pulse train is defined as "a sequence of pulses."

1.5 Delineation of Pulse Trains

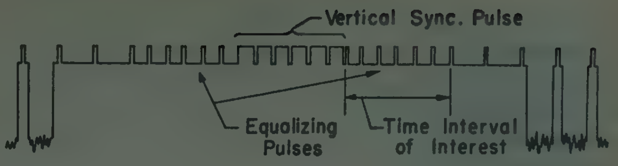
Measurements of pulse trains often require knowledge of the component pulses making up the pulse train. A picture of the pulse train alone may not permit the component pulses to be determined.

The following trains are given as examples of the difficulty of measuring the characteristics of a pulse train unless delineation of the component pulses is made.



Example 1. Rectangular Pulses

In example 1, the pulse train could be either a sequence of short positive pulses, long negative pulses, or alternating short positive and long negative pulses depending upon what constitutes the component pulses. Example 2 presents the same difficulty as example 1, with the additional complication that several types of component pulses are present. Even if it is known that this is a television signal, the determination of the characteristics of particular component pulses, for example the equalizing pulses, requires the additional concept of an interval of interest, which will be used frequently in these standards. For example, to determine the repetition rate of the equalizing pulses, one might choose a a time interval of interest as shown in the example. If one were required to determine the repetition rate of the vertical sync. pulses, another time interval of interest would have to be chosen. The determination of the characteristics of a complex pulse train may require the delineation of more than one type of component pulse and the use of more than one time interval of interest. The delineation of the component pulses and choice of an interval of interest should be made arbitrarily only if *a priori* knowledge is not available, and in either case the results should be clearly stated.



Example 2. Television Signal

2. General Considerations

Although the methods of measurement given below cover a wide variety of pulse quantities, many of these methods involve the same measuring instruments, the same general techniques, and the same precautions. The following preface discusses some of these general precautions and techniques in greater detail than would have been possible under each separate method of measurement.

2.1 The Oscillograph

A pulse is best described graphically. The oscillograph, which provides pictorial representations of electrical quantities as functions of time, is commonly and constantly employed in pulse work. The term "oscillograph" as it is used here includes the entire family of devices such as cathode-ray oscilloscopes, ink-writing recorders, etc., which give either a permanent or nonpermanent record of an electrical quantity. It will be understood that the pulse may be current, power, frequency, etc. Since the oscillograph is usually voltage operated, a conversion device (transducer) may be required in connection with the oscillograph to convert the quantity being measured to a voltage. The transfer characteristics (amplitude and time scale factors, linearity, response function, etc.) of the test setup, the transducer, and the oscillograph must be known to enable measurements of the desired quantity to be made in terms of the calibrated deflections of the oscillograph.

In many cases it will be convenient and desirable to select a transducer having simple transfer characteristics (for example, linear, wide-band devices), so that conversion from the oscillograph deflections to the quantities being measured can be readily obtained. It is recommended that the instruments used and their transfer characteristics be stated when reporting the results of measurement.

Some other type of instrument (for example, a vacuum-tube voltmeter, elapsed time meter, calorimeter, etc.) may provide a more convenient or accurate means of measurement than an oscillograph. However, in order to avoid possible serious errors, it is usually necessary first to observe and measure the desired quantity with an oscillograph.

Many oscillographs have features that aid in presenting a stable picture of the pulse and provide amplitude and time scale calibrations. These are very helpful in pulse work and should be used whenever accurate measurements are desired.

2.2 Bandwidth and Phase Response

The accuracy of measurement of a pulse quantity depends on the bandwidth and phase response of the measuring instrument and any associated transducer. Accuracy is usually improved by increasing the upper frequency limit and decreasing the lower frequency limit. In order to determine a minimum required upper frequency limit, it is generally necessary to decide upon a minimum time resolution. If the required minimum time resolution is T_1, then the upper frequency limit (3db) of the measuring instrument should be approximately $1/(2T_1)$, to give a minimum acceptable degree of accuracy in measuring the pulse quantity. For example, if in a certain circuit the constants are such that disturbances less than 0.1 microsecond in duration will not influence the operation, the required upper frequency limit is 5 megacycles. In many applications the minimum time resolution is determined by the bandwidth of the circuits associated with the pulse to be observed. The time resolution may also be determined by the degree of detail of a pulse the observer requires. For example, a pulse with a sharp spike requires a measuring instrument having a shorter resolution time (higher frequency limit) than does a pulse with no such spike or one in which the pulse spike is to be ignored.

In order to determine the required lower frequency limit, it is necessary to decide upon a time interval of interest. If T_2 is the time interval of interest, then the lower frequency limit (3db) is K/T_2, where K is the maximum error (or fractional droop) that can be tolerated. For example, if a 1 per cent accuracy is required and the time interval of interest is 1,000 microseconds, then the lower frequency limit should be at least as low as 10 cycles per second.

For proper response the phase characteristic of the instrument should be such that the time of transmission of all significant frequency components is constant (in other words, linear phase shift with frequency).

2.3 Precautions

In pulse measurements, the precautions generally necessary in rf work may be required. These include attention to such matters as (a) adequate shielding of measuring equipment to prevent undesired coupling to other parts of the circuit; (b) detuning or loading effects caused by measuring equipment input admittance; (c) lead length which may introduce resonance effects; (d) proper terminations; (e) choice of components to function properly at the frequencies encountered (e.g., the use of noninductive resistors); (f) residual parameters in circuit elements (e.g., inductance present in capacitors); (g) proper physical location of ground leads; and (h) the nonlinear behavior of circuit elements.

2.4 Units

The units (volts, amperes, coulombs, seconds, etc.) should be specified in reporting the results of a measurement.

2.5 Operating Conditions

The equipment or circuits on which the pulse measurements are to be made should be in normal operating condition unless otherwise specified, but in any case the operating conditions should be stated.

3. METHODS OF MEASUREMENT

3.1 Average Absolute Pulse Amplitude

3.1.1 Definition (51 IRE 20. S1)

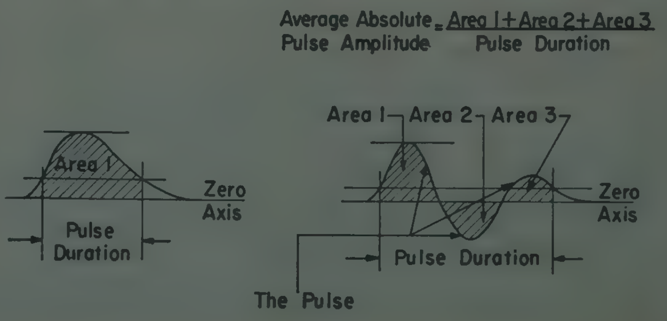
The average of the absolute value of the instantaneous amplitude taken over the pulse duration.

Note: By "absolute value" is meant the arithmetic value regardless of algebraic sign.

3.1.2 Method of Measurement

1. Obtain a calibrated (time and amplitude) picture of the waveform including the pulse. Delineate the pulse by excluding those portions of the waveform determined to be nonpertinent.
2. Draw the zero axis of the pulse and mark the end points of the pulse duration on the picture. (*See* 3.11)
3. Determine the areas between the end points above and below the zero axis, taking into account any nonlinearity of scales.
4. Add the areas without regard to sign.
5. Divide the sum of the areas by the pulse duration to obtain the average absolute pulse amplitude.

3.1.3 Pictorial Examples



3.2 Average Pulse Amplitude

3.2.1 Definition (51 IRE 20. S1)

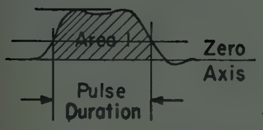
The average of the instantaneous amplitude taken over the pulse duration.

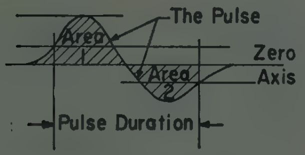
3.2.2 Method of Measurement

1. Obtain a calibrated (time and amplitude) picture of the waveform including the pulse. Delineate the pulse by excluding those portions of the waveform determined to be nonpertinent.
2. Draw the zero axis of the pulse and mark the end points of the pulse duration on the picture. (*See* 3.11)
3. Determine the areas between the end points above and below the zero axis taking into account any nonlinearity of scales.
4. Add the areas with regard to sign; that is, areas on opposite sides of the zero axis have opposite signs.
5. Divide the net area by the pulse duration to obtain the average pulse amplitude.

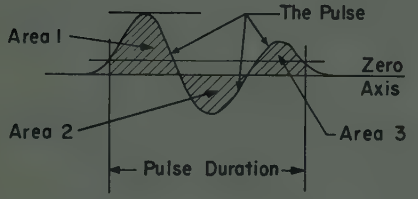
3.2.3 Pictorial Examples

$$\text{Average Pulse Amplitude} = \frac{\text{Area 1} - \text{Area 2}}{\text{Pulse Duration}}$$


Area 1
Zero Axis
Pulse Duration


The Pulse
Area 1
Area 2
Zero Axis
Pulse Duration

$$\text{Average Pulse Amplitude} = \frac{\text{Area 1} - \text{Area 2} + \text{Area 3}}{\text{Pulse Duration}}$$


The Pulse
Area 1
Zero Axis
Area 2
Area 3
Pulse Duration

3.3 Crest Factor of a Pulse

3.3.1 Definition (51 IRE 20. S1)

The ratio of the peak pulse amplitude to the rms pulse amplitude.

3.3.2 Method of Measurement

1. Measure the peak pulse amplitude. (*See* 3.7)
2. Measure the rms (effective) pulse amplitude. (*See* 3.15)
3. Divide the peak pulse amplitude by the rms pulse amplitude to obtain the crest factor of the pulse.

3.4 Leading Edge Pulse Time

3.4.1 Definition (51 IRE 20. S1)

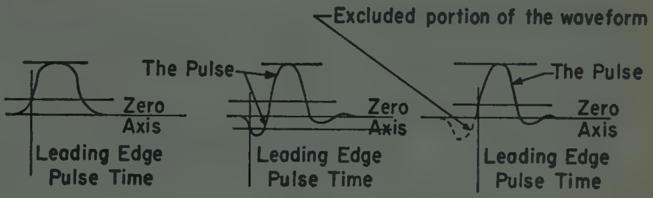
The time at which the instantaneous amplitude first reaches a stated fraction of the peak pulse amplitude.

3.4.2 Method of Measurement

1. Obtain a calibrated (time and amplitude) picture of the waveform including the pulse. Delineate the pulse by excluding those portions of the waveform determined to be nonpertinent.
2. Draw the zero axis of the pulse.
3. Find the peak pulse amplitude. (*See* 3.7)
4. Draw two lines parallel to the zero axis, spaced on each side of the zero axis by the stated fraction of the peak pulse amplitude. The time of the first point of intersection of the pulse trace and either line is the Leading Edge Pulse Time.

Note: The stated fraction may not correspond to that used in the measurement of Trailing Edge Pulse Time.

3.4.3 Pictorial Examples


Excluded portion of the waveform
The Pulse
Zero Axis
Leading Edge Pulse Time
The Pulse
Zero Axis
Leading Edge Pulse Time
The Pulse
Zero Axis
Leading Edge Pulse Time

3.5 Trailing Edge Pulse Time

3.5.1 Definition (51 IRE 20. S1)

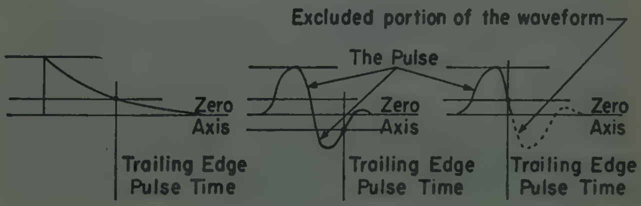
The time at which the instantaneous amplitude last reaches a stated fraction of the peak pulse amplitude.

3.5.2 Method of Measurement

1. Obtain a calibrated (time and amplitude) picture of the waveform including the pulse. Delineate the pulse by excluding those portions of the waveform determined to be nonpertinent.
2. Draw the zero axis of the pulse.
3. Find the peak pulse amplitude. (*See* 3.7)
4. Draw two lines parallel to the zero axis, spaced on each side of the zero axis by the stated fraction of the peak pulse amplitude. The time of the last point of intersection of the pulse trace and either line is the Trailing Edge Pulse Time.

Note: The stated fraction may not correspond to that used in the measurement of Leading Edge Pulse Time.

3.5.3 Pictorial Examples


Excluded portion of the waveform
The Pulse
Zero Axis
Trailing Edge Pulse Time
Zero Axis
Trailing Edge Pulse Time
Zero Axis
Trailing Edge Pulse Time

3.6 Mean Pulse Time

3.6.1 Definition (51 IRE 20. S1)

The arithmetic mean of the Leading Edge Pulse Time and the Trailing Edge Pulse Time.

Note: For some purposes the importance of a pulse is that it exists (or is large enough) at a particular instant of time. For such applications the important quantity is the Mean Pulse Time. The Leading Edge Pulse Time and the Trailing Edge Pulse Time are significant primarily in that they may allow a certain tolerance in timing.

3.6.2 Method of Measurement

1. Measure the Leading Edge Pulse Time. (*See* 3.4)
2. Measure the Trailing Edge Pulse Time. (*See* 3.5)
3. Calculate the arithmetic mean of the Leading Edge Pulse Time and the Trailing Edge Pulse Time. The result is the Mean Pulse Time, which is midway between the Leading Edge Pulse Time and the Trailing Edge Pulse Time when the pulse is portrayed graphically.

3.7 Peak Pulse Amplitude

3.7.1 Definition (51 IRE 20. S1)

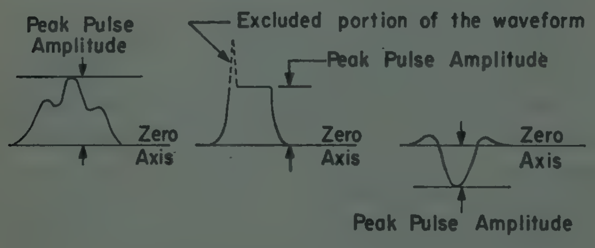
The maximum absolute peak value of the pulse, excluding those portions considered to be unwanted, such as spikes.

Note: Where such exclusions are made, pictorial illustration of the amplitude chosen is desirable.

3.7.2 Method of Measurement

1. Obtain a calibrated (time and amplitude) picture of the waveform including the pulse. Delineate the pulse by excluding those portions of the waveform determined to be nonpertinent.
2. Draw the zero axis of the pulse.
3. Find the maximum departure of the pulse trace from the zero axis (regardless of sign). This departure is the peak pulse amplitude.

3.7.3 Pictorial Examples



3.8 Pulse Spectrum (Pulse frequency spectrum)

3.8.1 Definition (51 IRE 20. S1)

The frequency distribution of the sinusoidal components of the pulse in relative amplitude and relative phase.

Note: The definition of this term was phrased to convey the idea that the spectrum is a complex (phasor) function of frequency and to express this function most nearly in a manner which corresponds to the method of measuring it (i.e., measuring amplitude and phase separately).

3.8.2 Method of Measurement

1. *Amplitude spectrum*

If only the amplitude spectrum is desired, and if the pulse can be repeated periodically to form a pulse train, the amplitude spectrum of the pulse train may be obtained with a spectrum analyzer using the method given under Pulse Train Spectrum. The envelope of the amplitude spectrum of the pulse train is the amplitude spectrum of the single pulse for positive frequencies.

Note: The pulse repetition period should be long in comparison with the pulse duration, so as to provide sufficient density of the spectrum lines to determine the envelope to the desired degree of accuracy.

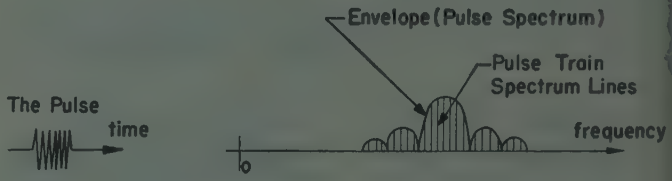
2. *Amplitude and phase spectrum*

a. Obtain a calibrated (time and amplitude) picture of the waveform including the pulse. Delineate the pulse by excluding those portions of the waveform determined to be nonpertinent.

b. Obtain the Fourier transform of the waveform to obtain the amplitude and phase spectrum.

3.8.3 Pictorial Examples

Note: This example applies to Method 1 only.



3.9 Pulse Bandwidth

3.9.1 Definition (51 IRE 20. S1)

The smallest continuous frequency interval outside of which the amplitude of the spectrum does not exceed a prescribed fraction of the amplitude at a specified frequency.

Caution: This definition permits the amplitude of the spectrum to be less than the prescribed amplitude within the interval.

Note 1: Unless otherwise stated, the specified frequency is that at which the spectrum has its maximum amplitude.

Note 2: This term should really be "Pulse Spectrum Bandwidth," because it is the spectrum and not the pulse itself that has a bandwidth. However, usage has caused the contraction and for that reason the term has been accepted.

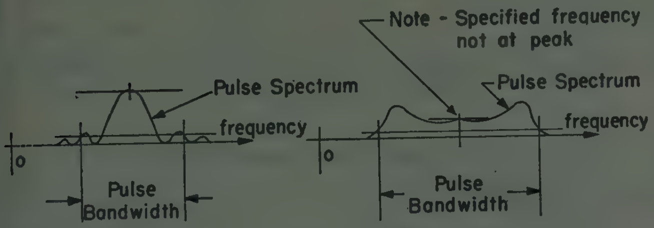
Note 3: Unless otherwise stated, only positive frequencies are to be considered.

3.9.2 Method of Measurement

1. Obtain a calibrated picture of the amplitude spectrum. (*See* 3.8)
2. Determine the amplitude at the specified frequency.
3. Draw a line parallel to the zero axis spaced from the zero axis by the prescribed fraction of the amplitude at the specified frequency.
4. The first and last points of intersection (consider only positive frequencies) of the spectrum trace and the line determine the frequency limits outside of which the amplitude of the spectrum does not exceed the pre-

scribed fraction. The difference between these two limits is the Pulse Bandwidth.

3.9.3 Pictorial Examples



3.10 Pulse Decay Time

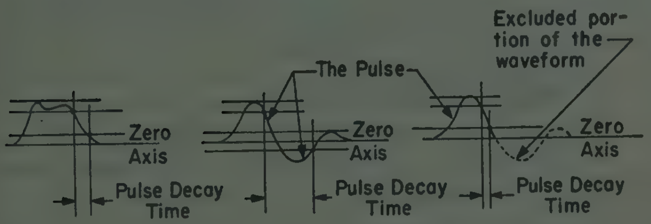
3.10.1 Definition (51 IRE 20. S1)

The interval between the instants at which the instantaneous amplitude last reaches specified upper and lower limits, namely, 90 per cent and 10 per cent of the peak pulse amplitude unless otherwise stated.

3.10.2 Method of Measurement

1. Obtain a calibrated (time and amplitude) picture of the waveform including the pulse. Delineate the pulse by excluding those portions of the waveform determined to be nonpertinent.
2. Draw the zero axis of the pulse.
3. Find the peak pulse amplitude. (*See* 3.7)
4. Draw two lines parallel to zero axis spaced on each side of zero axis by 90 per cent (or stated fraction) of peak pulse amplitude, and two parallel lines spaced on each side of zero axis by 10 per cent (or stated fraction) of peak pulse amplitude. Time interval between last point of intersection of pulse trace and either 90 per cent line and last point of intersection of pulse trace and either 10 per cent line is Pulse Decay Time.

3.10.3 Pictorial Examples



3.11 Pulse Duration

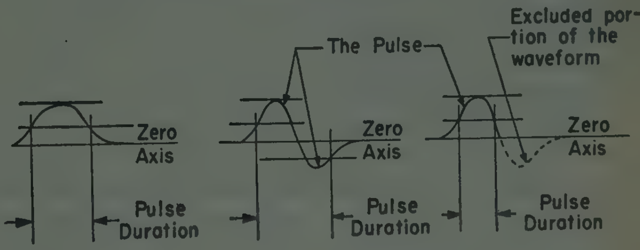
3.11.1 Definition (51 IRE 20. S1)

The time interval between the first and last instants at which the instanteous amplitude reaches a stated fraction of the peak pulse amplitude.

3.11.2 Method of Measurement

1. Obtain a calibrated (time and amplitude) picture of the waveform including the pulse. Delineate the pulse by excluding those portions of the waveform determined to be nonpertinent.
2. Draw the zero axis of the pulse.
3. Find the peak pulse amplitude. (*See* 3.7)
4. Draw two lines parallel to the zero axis, spaced on each side of the zero axis by the stated fraction of the peak pulse amplitude. The time interval between the first and last points of intersection of the pulse trace and either line is the Pulse Duration.

3.11.3 Pictorial Examples



3.12 Pulse Duty Factor

3.12.1 Definition (51 IRE 20. S1)

The ratio of the average pulse duration to the average pulse spacing.

Note 1: This is equivalent to the product of the average pulse duration and the pulse repetition rate.

Note 2: The terms "average pulse duration" and "average pulse spacing" imply a time interval over which the averaging takes place. In the method of measurement below, this time interval is called the time interval of interest.

Note 3: The above definition defines pulse duty factor basically as a ratio of time "on" to total time. This is not in agreement with the use of the term "duty factor" as a ratio of average to peak power, except in special cases, such as that of a rectangular pulse. Care should be taken not to confuse the two meanings of "duty factor" when dealing with unusual pulse shapes.

Note 4: If the Pulse Duty Factor desired is that of a sub-group within a complex train (for example, vertical sync. pulses in a TV signal, channel pulses in a time-division multiplex system, etc.), the particular subgroup must be specified.

3.12.2 Method of Measurement

1. Measure the pulse duration (*see* 3.11) of each individual pulse in the pulse train included in the time interval of interest.
2. Divide the sum of the pulse durations by the time interval to obtain the pulse duty factor.

3.13 Average Pulse Duration

3.13.1 Definition

The average, over the time interval of interest, of the durations of the individual pulses of a pulse train.

3.13.2 Method of Measurement

1. Decide on the time interval of interest.
2. Measure the pulse duration (*see* 3.11) of each pulse in this time interval.
3. Find the average pulse duration by dividing the sum of the individual pulse durations by the number of pulses in the time interval of interest.

3.14 Pulse Rise Time

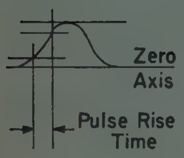
3.14.1 Definition (51 IRE 20. S1)

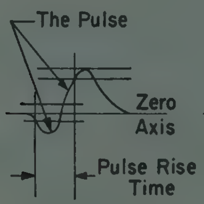
The interval between the instants at which the instantaneous amplitude first reaches specified lower and upper limits, namely, 10 per cent and 90 per cent of the peak pulse amplitude unless otherwise stated.

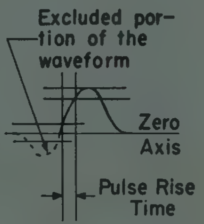
3.14.2 Method of Measurement

1. Obtain a calibrated (time and amplitude) picture of the waveform including the pulse. Delineate the pulse by excluding those portions of the waveform determined to be nonpertinent.
2. Draw the zero axis of the pulse.
3. Find the peak pulse amplitude. (*See* 3.7)
4. Draw two lines parallel to the zero axis and spaced on each side of the zero axis by 90 per cent (or stated fraction) of the peak pulse amplitude, and two parallel lines spaced on each side of the zero axis by 10 per cent (or stated fraction) of the peak pulse amplitude. The time interval between the first point of intersection of the pulse trace and either 10 per cent line and the first point of intersection of the pulse trace and either 90 per cent line is the Pulse Rise Time.

3.14.3 Pictorial Examples







3.15 RMS Pulse Amplitude

3.15.1 Definition (51 IRE 20. S1)

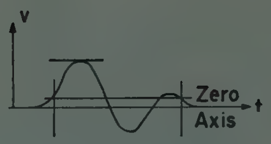
The square root of the average, over the pulse duration, of the square of the instantaneous amplitude.

3.15.2 Method of Measurement

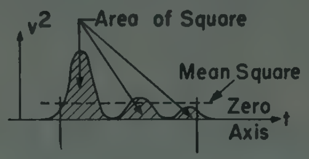
1. Obtain a calibrated (time and amplitude) picture of the waveform including the pulse. Delineate the pulse by excluding those portions of the waveform determined to be nonpertinent.
2. Draw the zero axis of the pulse and mark the end points of the pulse duration on the picture. (*See* 3.11)
3. Plot the square of the instantaneous amplitude between the end points and measure the enclosed area.
4. Divide the area by the pulse duration to obtain the mean-square amplitude.
5. Take the square root to obtain the RMS Pulse Amplitude.

3.15.3 Pictorial Examples

Step (2)



Step (3) and Step (4)



3.16 Average Pulse Repetition Rate

3.16.1 Definition

The number of pulses in the time interval of interest divided by that time interval.

Note 1: The time interval of interest must be clearly understood or stated, since it affects the results of measurement in many cases.

Note 2: If the Average Pulse Repetition Rate desired is that of a subgroup within a complex train (for example, vertical sync. pulses in a TV signal, channel pulses in a time-division multiplex system (etc.) the particular subgroup must be specified.

3.16.2 Method of Measurement

1. Decide upon the time interval of interest.

Note: A picture of the pulses may be needed in order to decide upon this time interval.

2. Determine the number of pulses in the time interval.

Note: There are instruments that may be used to count the number of pulses automatically, such as a gated counter. It may also be possible to determine the number of pulses by comparison with an oscillator generating a known number of cycles or pulses during the time interval.

3. Divide the number of pulses by the time interval to obtain the Average Pulse Repetition Rate.

3.17 Pulse Spacing (Pulse Interval)

3.17.1 Definition

The interval between the corresponding pulse times of two pulses.

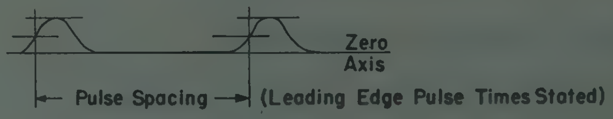
Note 1: The two pulses should be clearly specified, whether consecutive or not. The particular pulse time used should be stated.

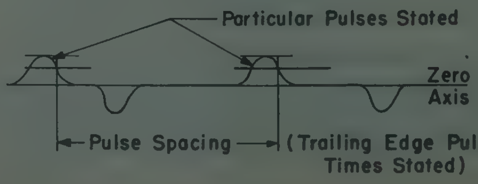
Note 2: The term "pulse interval" is deprecated because it may be taken to mean the duration of the pulse. Neither term means the space between pulses (Pulse Separation).

3.17.2 Method of Measurement

1. Measure the pulse times of the pulses.
2. The difference in time of the corresponding pulse times is the Pulse Spacing.

3.17.3 Pictorial Examples





The Cascade Backward-Wave Amplifier: A High-Gain Voltage-Tuned Filter for Microwaves[*]

M. R. CURRIE[†], ASSOCIATE, IRE, AND J. R. WHINNERY[‡], FELLOW, IRE

Summary—**The characteristics of a backward-wave circuit as a beam modulator and as a beam demodulator are investigated theoretically and experimentally. A basic modulator-demodulator configuration, consisting of two periodic circuits (e.g., helices) separated by an arbitrary transducer section, constitutes the basis for a new class of backward-wave tubes. These "cascade backward-wave amplifiers" behave as narrow-band amplifiers whose pass bands can be tuned electronically over a wide range of frequencies. They overcome most of the inherent disadvantages of the simple single-circuit backward-wave amplifier and feature high gain well removed from the oscillation region, high off-signal rejection, internal circuit terminations which smooth out variations in operating characteristics with frequency, and provision for adjusting bandwidth electronically. The characteristics of an experimental model at *S*-band are presented and compared with theory. Analysis indicates that a minimum noise figure in the same range as that of a conventional traveling-wave tube, i.e., about 6 db, should be attainable.**

INTRODUCTION

THE PRACTICAL importance of the backward-wave oscillator has imparted considerable impetus to the detailed study of its characteristics. Calculations of start-oscillation conditions, measurements of efficiency and work on various types of periodic circuits for operation over frequency ranges embracing the whole microwave spectrum have progressed since the recent announcement of this novel device.[1] However, some important aspects of backward-wave interaction have received little or no attention, e.g., the use of a backward-wave tube as a narrow-band electronically tunable amplifier. Its characteristics complement those of the conventional traveling-wave tube and are of potential importance in certain types of microwave systems. From a more fundamental point of view no effort has been directed towards a broad examination of the interaction mechanism when boundary conditions other than those presented by the simple oscillator configuration are imposed.

This paper presents the characteristics of a backward-wave circuit when considered as a beam modulator or as a beam demodulator. A new class of backward-wave tubes based on a simple modulator-demodulator configuration is evolved from these basic considerations. These tubes, termed cascade backward-wave amplifiers, can be regarded roughly as extensions of the klystron concept to nonresonant circuits. The study shows that they overcome some inherent practical limitations of the conventional or single-section backward-wave amplifier.

Following a qualitative description of the basic model and its potential advantages, some typical performance curves obtained with an experimental tube are presented and compared with theory. The analysis of the modulator-demodulator model is presented in the final section of the paper. Both the theoretical and experimental studies indicate that the cascade backward-wave amplifier possesses considerable flexibility as a voltage-tuned filter or as a swept amplifier.

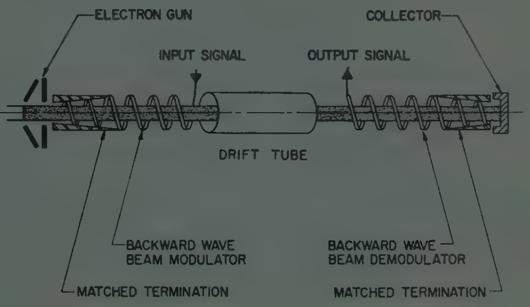


Fig. 1—The basic model of a cascade backward-wave amplifier. The first helix modulates the electron beam; the second helix acts as a beam demodulator. The extreme ends of the tube are matched internally. Other backward-wave structures than helices could be employed. The drift tube is not an essential part of the model but can be used as a gain equalizer. Note the analogy between this configuration and that of a klystron amplifier.

THE BASIC MODEL AND ITS POTENTIAL USEFULNESS

The model of primary concern to this discussion is pictured in Fig. 1. An electron beam is first modulated by a section of helix or other slow-wave structure interacting with a backward wave. The input signal is introduced at the collector end of the first helix and is amplified as it travels toward the gun end of the tube. There the amplified signal is assumed to be dissipated in a matched helix termination which could be located in an external transmission line or on the circuit itself. In the general model, the modulated electron stream then passes through a drift tube (although this is not essential to the operation), and then into a second helix

---

[*] Original manuscript received by the IRE, April 29, 1955; revised manuscript received, June 15, 1955. Most of this research was carried out at the Electronics Research Laboratory, University of California, and was submitted by M. R. Currie as part of a doctoral dissertation. The work was sponsored by the U. S. Air Force under Contract AF33(616)-495. The noise analysis was carried out at the Electron Tube Laboratory, Hughes Aircraft Company.

[†] Res. and Dev. Labs., Hughes Aircraft Co., Culver City, Calif.
[‡] Electronics Res. Lab., University of California, Berkeley, Calif.

[1] Backward-Wave Oscillators were first announced by R. Kompfner and B. Epzstein in papers presented at the Tenth Annual Conference on Electron Tube Research, Ottawa, Canada; June, 1952.

or other slow-wave circuit also interacting with a backward wave. The output signal is thus taken from the gun end of the second helix, with the collector end of this circuit matched. In the succeeding discussion the first helix will be referred to as the beam modulator; the second helix will be referred to as the beam demodulator, since it extracts energy from the beam, although it may leave the beam more bunched and spread out in velocity than before entering the helix.

As explained in the basic references on backward-wave interaction,[2,3] such a wave has group velocity and phase velocity in opposite directions. Thus, when the phase velocity is in the direction of the beam and in approximate synchronism with the beam so that energy interchange takes place much as in a conventional traveling-wave tube, energy flows and increases "backward" toward the gun end. There is also an inherent regeneration from the energy flow loops established by the oppositely directed movements of energy in the circuit and the beam. Thus, regenerative amplification is available below a certain critical or "start-oscillation" current, and oscillation above that current. Either the oscillation or the regenerative amplification is voltage tunable over a wide range because of the inherent dispersive character of the backward waves which may be supported by any geometrically periodic structure.[4]

The single-helix backward-wave amplifier, pictured in Fig. 2, has already been analyzed.[5] In this, the rf input is at the collector end and the rf output at the gun end, with operation below the start-oscillation current to yield the regenerative gain just described. A narrow-band amplifier of relatively high gain is thus obtainable with electrical tuning over a wide range. This characteristic is potentially very useful but there are certain disadvantages in the single-helix structure which restrict its practical usefulness. The most serious is that operation with reasonably high gain requires currents near the start-oscillation current, so that stable operation is difficult. Fig. 2, which gives the calculated gain of a single-helix backward-wave amplifier, shows that 20-db gain requires a current 90 per cent of the start-oscillation current; moreover, the slope of the curve is very steep in this region so that the gain is critically dependent on small changes in current. If the rf transitions to external circuitry are imperfect, the resulting internal reflections cause the value of starting current to fluctuate periodically about an ideally smooth curve as frequency changes, thus causing sharp gain fluctuations or possible excursions into the oscillation region as the amplifier is swept over a range of frequencies.

As will be shown by the calculated and measured curves of this paper, the two-circuit version of the backward-wave amplifier as sketched in Fig. 1 gives relatively high gain with operating currents only 50 to 70 per cent of start-oscillation current. The slope of the gain-versus-current curve is also much smaller for a given gain, so that stabler operation is possible over the band. Another important advantage of the cascade amplifier lies in the freedom to terminate one end of each circuit in an internal reflectionless match. With tapered terminations placed on the circuit, the operating characteristics can be made to vary smoothly with frequency, and design for almost constant gain over a large frequency range is possible.

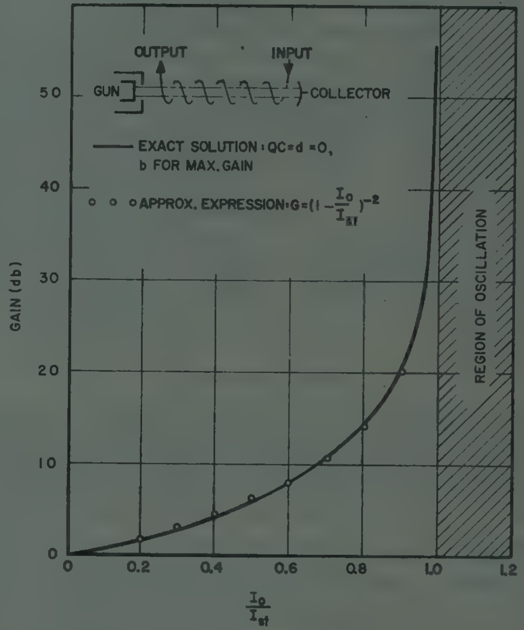


Fig. 2—Theoretical curve of gain vs current for a single-circuit backward-wave amplifier. The operating current I_0 is normalized with respect to the start-oscillation current I_{st}. The curve is for $QC=0$, $d=0$ and optimum b. It is fitted closely by the simple relationship shown.

A third advantage comes from the break between input and output circuits. Only a narrow band of frequencies whose corresponding backward-wave phase velocities are in approximate synchronism with the beam velocity can be coupled onto the output circuit; other signals are simply dissipated in the lossy termination on the input circuit. The off-signal rejection of the cascade amplifier is therefore very high, whereas the single-circuit backward-wave amplifier provides a direct feed-through path which must be broken artificially if adequate cold loss is to be introduced.

It is often desirable in filter applications to be able to adjust bandwidth. The cascade-circuit structure can, in a rough sense, be considered as two high-Q circuits coupled in series from input to output. Thus, the possibility of altering bandwidth by stagger tuning the sections exists. This can be done by operating them at slightly different potentials. The result is a filter whose center frequency and bandwidth both can be varied electronically.

---

[2] R. Kompfner and N. T. Williams, "Backward-wave tubes," Proc. IRE, vol. 41, pp. 1602–1611; November, 1953.

[3] H. Heffner, "Analysis of the backward-wave traveling-wave tube," Stanford E.R.L. Rep. No. 48; June 18, 1952.

[4] L. Brillouin, "Wave Propagation on Periodic Structures," McGraw-Hill Book Company, Inc., ch. V; 1948.

[5] H. Heffner, "Analysis of the backward-wave traveling-wave tube," Proc. IRE, vol. 42, pp. 930–937; June, 1954.

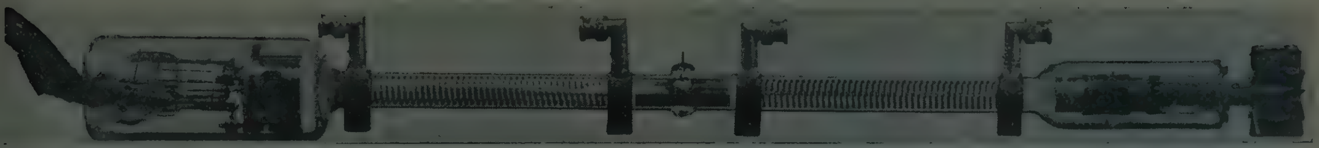


Fig. 3—Photograph of an experimental cascade backward-wave amplifier. This tube operates in the range 2–4 kmc, and employs a hollow electron beam. External connections were made to the gun end of the input helix and to the collector end of the output helix to lend added flexibility to the experiment.

Before leaving the general description, it is interesting to note the resemblance between the cascade backward-wave amplifier of Fig. 1 and a conventional two-cavity klystron. The first helix modulates the stream; there is a drift action in the drift tube (and in portions of the helices); and the second helix removes rf power from the beam. As will be noted in the later analysis, the tube actually has a very good figure of merit if compared with a klystron at a fixed frequency, but the distinct difference comes from the voltage tunability inherent in the backward-wave structure.

The model not only has application as a practical device, but also has fundamental interest in studying modulation of a beam and energy extraction from a beam by backward-wave interaction, or in the interaction of a backward wave on one helix with a forward wave on the other. Another model analyzed and recently built utilizes a third (floating) helix in place of the drift tube between the modulator and demodulator. Still other "space-charge wave transducers" could be used.

PERFORMANCE CURVES OF THE AMPLIFIER

In this section it is desired to show certain calculated and measured performance curves for the cascade backward-wave amplifier following the model of Fig. 1. The calculated curves are from formulas derived in the final section of the paper. The measured curves were taken on a tube pictured in Fig. 3. This tube was designed for *S*-band, utilized a hollow-beam gun, tape helices for the backward-wave interaction structure, and a drift space between the helices as in the model of Fig. 1. Input and output helices are each $5\frac{1}{2}$ inches long, 0.545-inch inside diameter, and 0.125-inch pitch. The drift tube is $2\frac{1}{2}$ inches long (nominally $\frac{1}{8}$ plasma wavelength at the center of the 2–4 kmc band). All four ends of the helices were brought out to type BNC angle connectors to give added flexibility to the experiment. The hollow beam, used to secure strong interaction with the backward-wave (-1) component of the h_{t0} helix mode,[6] has a radial thickness of 0.030 inch and is separated from the helix by approximately 0.025 inch. The measured cold isolation between the two helix sections was greater than 50 db.

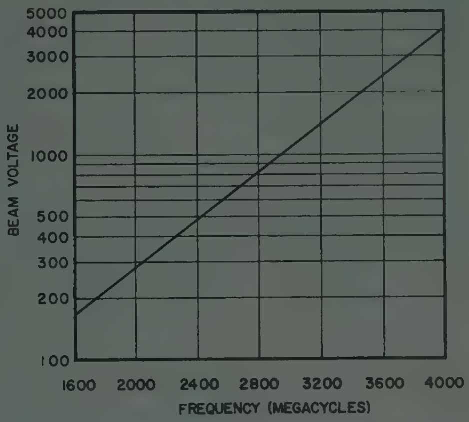


Fig. 4—Tuning curve showing the beam voltage at maximum gain vs frequency for the experimental tube described in this paper.

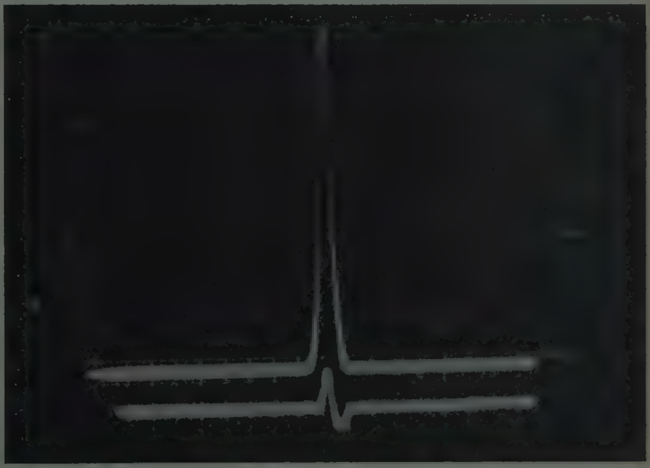


Fig. 5—Oscilloscope traces of output power as the cascade backward-wave amplifier is swept in voltage. The signal input is at 2,950 mc. The small gain spike was taken from the first helix and so represents the output of a single-circuit backward-wave amplifier. The large spike was taken from the second helix and demonstrates the increased gain produced by the composite tube. The same detection system was used to record each trace. The beam current was about $\frac{1}{2}$ the start-oscillation value. The basewidth of the large spike is about 60 mc.

The measured tuning curve of the experimental amplifier, Fig. 4, shows a tuning range from 2,000 to 4,000 mc with voltage variation from 270 to 4,000 volts. Either frequency or voltage variation could be changed to some extent by modification of the helix design. Fig. 5 shows an oscilloscope comparison of the gain from the two-helix tube with that from one of the helices operating as a single-helix backward-wave amplifier at the same ratio of operating to starting current. The two traces were recorded successively with the same detection system and represent power output versus beam voltage as the tube was swept over a frequency

---

[6] S. Sensiper, "Electromagnetic Wave Propagation on Helical Conductors," Sc.D. Dissertation, Mass. Inst. Tech., ch. II; 1951.

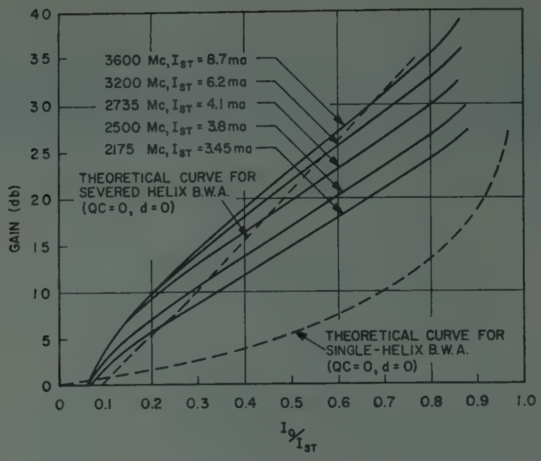


Fig. 6—Experimental curves of gain vs normalized current at several different frequencies. Theoretical curves for the single-helix backward-wave amplifier and for the idealized severed-helix amplifier (no drift tube) are shown for comparison. The frequency dependence of the experimental curves is caused by the drift tube.

range centered on 3,000 mc. The small gain spike was taken from the gun end of the signal launcher, and so represents the gain of the single-helix backward-wave amplifier. The base line of this trace represents the average power of the signal generator. The dip to the right of the gain spike is a region of negative gain in which the interaction has become degenerative. Other maxima and minima of the interference pattern decrease in amplitude as one departs farther from synchronism with the circuit wave. The large response curve was taken from the gun end of the second helix and shows the large and very clean response of the two-helix tube. Since no direct feed-through path exists from input to output, the reference line on this trace represents essentially zero power.

Fig. 6 shows measured values of gain vs current for the experimental tube, taken at several frequencies. Measurements were taken cw with bolometers located both at the output of the composite tube and at the output of the first helix. Tuning stubs were employed but were not adjusted during measurements at a particular frequency. Considerably greater apparent gain could be obtained by deliberate mismatching so as to reinforce the output signal by internal reflections. One of the theoretical curves shown for comparison is that for a single-helix amplifier, showing the much smaller gain for a given current. The other is the calculated curve for a two-helix tube with no drift space between helices (denoted severed-helix tube). Much of the variation with frequency is thus seen to come from the drift space, and in later calculations it is shown that the effect of the drift tube is to subtract increasingly from the over-all gain as the frequency is lowered. Note that for a single-helix amplifier, gain would be expected to increase with decreasing frequency because of increased space-charge at the low voltages, and this effect was observed in the output of the first section alone.

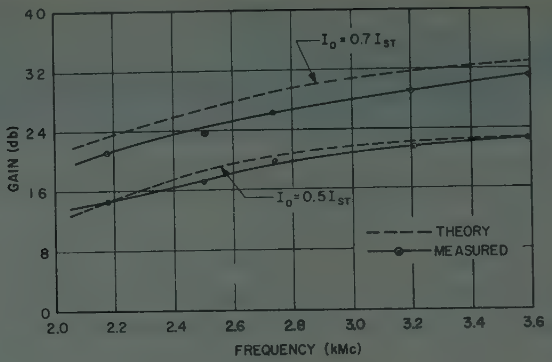


Fig. 7—Comparison of measured and theoretical gain as a function of frequency for the experimental cascade backward-wave amplifier. The curves are shown for two different ratios of operating current to the start-oscillation current. The calculated curves include the effects of the drift tube.

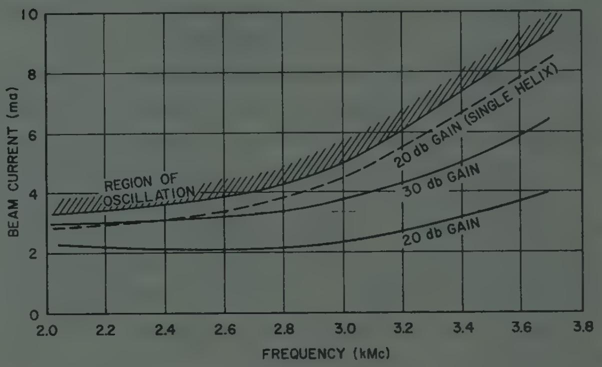


Fig. 8—Curves showing the current necessary to maintain constant gain as the experimental cascade amplifier was tuned in frequency. The actual curves were not smooth because of internal reflections due to poor matching.

Fig. 7 shows gain vs frequency for two values of normalized current. Here the theoretical curves do take into account the effect of the drift region. Very close agreement between calculated and measured curves is shown, but as the calculations neglect the finite circuit loss and space-charge effects, this should not be taken too literally. There is a variation of gain with frequency for a given current setting, but this could be compensated for if required by a straightforward AGC circuit. Fig. 8 shows the required variation in current as a function of frequency for constant gains of 20 db and 30 db. The actual curve was not as smooth as shown because of poor matching at the extreme ends of the experimental tube. However, it serves to illustrate the role of the drift tube as a gain equalizer and the flexibility this element lends to the over-all design. A more recent tube has yielded an insertion gain flat within several db over a 50-per cent frequency range at *S*-band.

The frequency bandwidth was measured at several different frequencies and gains; the measured results were in fair agreement with those calculated from (33) and Fig. 14. For example, at 3,000 mc and 30-db gain, the bandwidth was about 9 mc corresponding to a *Q* of 330. The predicted *Q* was 360. The gain-bandwidth product was a strongly increasing function of gain. A

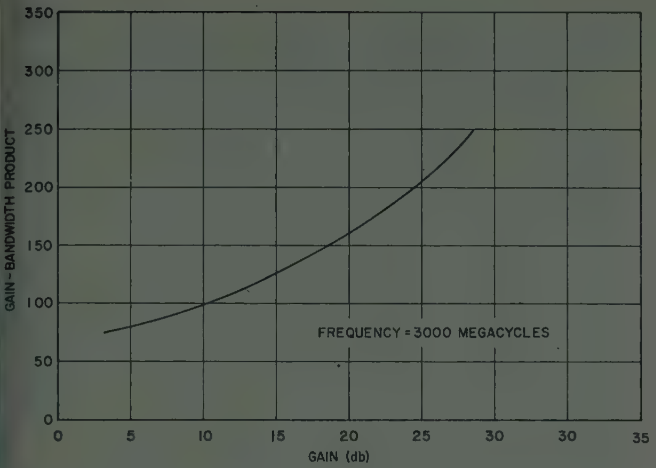


Fig. 9—Experimental curve of the voltage-gain times bandwidth (megacycles) product vs gain (db) at 3,000 mc. The gain-bandwidth product increases rapidly with gain level in the cascade amplifier.

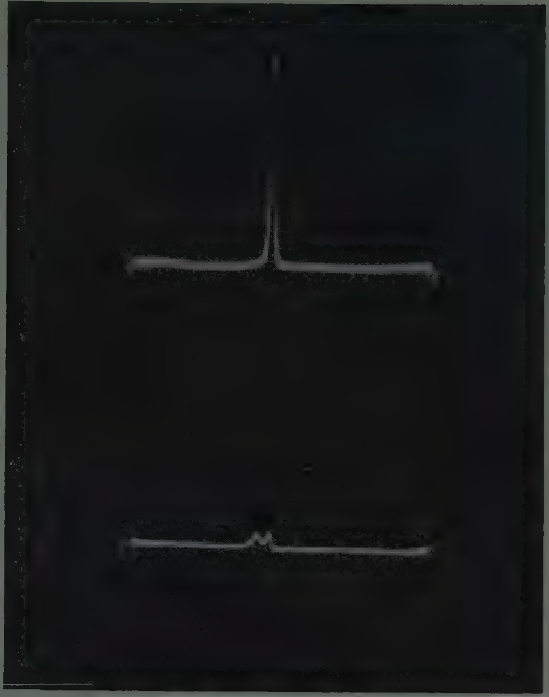


Fig. 10—Oscilloscope traces showing the effect of stagger tuning on bandwidth. The cascade amplifier was operated at fixed voltage and the input frequency was swept from 2 to 3 kmc by means of a backward-wave oscillator. The large response represents 19-db gain and 10 mc bandwidth and was taken with the input and output helices synchronized. The smaller response was for 30 volts between helices; it shows a gain of 11 db and a bandwidth of 38 mc and displays the double-humped shape characteristic of tuned circuits. The basewidths are approximately 48 and 142 mc, respectively.

typical curve is shown in Fig. 9. The gain-bandwidth product of a single-circuit backward-wave amplifier is much less dependent on gain and is almost constant. Thus, the bandwidth is largely fixed by the parameters of the input circuit; the increased gain-bandwidth product for the cascade configuration is due to its greatly increased gain at a given value of beam current.

The possibility of varying the bandwidth of the cascade amplifier by stagger tuning the input and output circuits (i.e., operating them at slightly different potentials so that synchronism between the circuit wave and the beam velocity occurs at slightly different frequencies in each section) is illustrated in Fig. 10. There, the input frequency was swept from 2.0 to 3.0 kilomegacycles with a backward-wave oscillator. The traces display output power vs frequency. With the modulator and demodulator circuits synchronized, the bandwidth at 2.7 kilomegacycles and 19-db gain was 10 megacycles. With a 30-volt potential difference between helices the gain dropped to about 11 db, and the bandwidth increased to 35 megacycles. The response resembles that of two tuned circuits which are stagger tuned. For smaller voltage differences it is possible to increase the gain-bandwidth product somewhat by this method. It appears that this feature could be very useful in applications where gain is only of secondary importance.

The noise figure was measured at one point and was about 24 db. This is in the same range as that of a typical forward-wave traveling-wave amplifier tube when no special effort is made to reduce the noise on the electron stream (e.g., by means of velocity jumps[7]); it is also in fair agreement with the calculated noise figure assuming space-charge limited flow from the cathode to the first helix and taking into account only the effects due to velocity fluctuations at the potential minimum. This result lends confidence to the analysis to be presented and indicates that the noise figure can be reduced considerably with a suitable electron gun.

Other experiments were conducted with the two-helix tube, one of which will be mentioned briefly here. The first helix was made shorter than the other by means of resistive termination on the tube's envelope. Thus, it was possible to operate at a current which was below the oscillation region for the first helix but above start-oscillation for the other. The helices were held at different dc potentials. Under these conditions the first helix modulated the beam at the frequency of the input signal. The second operated as a backward-wave oscillator at a slightly different frequency. Electronic mixing of the two frequencies took place on the beam and it was possible to pick up a sharp signal at the difference frequency. The beat frequency could be varied over a large range by changing the potential difference between helices.

ANALYSIS

Analysis of the General Model for Backward-Wave Interaction

Basic model to be analyzed is that of Fig. 11 (page 1622), in which beam is allowed to possess an arbitrary initial current and velocity modulation as it enters backward-wave circuit at $z=0$. The transmission-line approach is used, following Pierce's work.[8] The equations of motion and continuity are linearized (small signals) and motion only in the z-direction is allowed. Time dependence for rf quantities is assumed as $\exp(j\omega t)$. The resultant ballistic relation between rf convection current $i(z)$ and longitudinal field on the slow-wave circuit $E(z)$ is

---

[7] D. A. Watkins, "Traveling-wave tube noise figure," PROC. IRE, vol. 40, pp. 65–70; January, 1952.

$$\frac{d^2i(z)}{dz^2} + 2j\beta_e\frac{di(z)}{dz} + (\beta_q^2 - \beta_e^2)i(z) = \frac{-2j\beta_eC^3}{K}E(z). \quad (1)$$

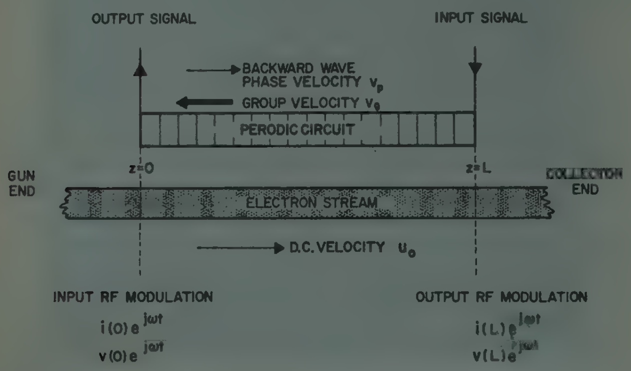


Fig. 11—The basic model for analysis. Beam is injected into the backward-wave circuit at $z=0$ with total velocity $u_0+v(0)e^{j\omega t}$ and total current $-I_0+i(0)e^{j\omega t}$. $v(0)$ and $i(0)$ are arbitrary both in magnitude and phase. The input signal is introduced at $z=L$.

Similarly, the modified telegrapher's equation, giving coupling between the circuit and stream, is

$$\frac{d^2E(z)}{dz^2} - \Gamma_0^2E(z) = -\Gamma_0K\frac{d^2i(z)}{dz^2}. \quad (2)$$

In the absence of the electron beam the circuit wave propagates as $\exp(j\omega t - \Gamma_0 z)$; β_q is the effective plasma frequency wave number and β_e the electron stream wave number, K is the impedance presented by the circuit to the beam, and C is the gain parameter, both as defined by Pierce.[9]

A self-consistent solution of the composite beam-circuit model involves the simultaneous solution of the above equations. $E(z)$ and $i(z)$ are then solutions of fourth-order linear differential equations. The associated constants in the solutions must be fixed by four independent boundary conditions. The current and velocity modulation can be independently specified at $z=0$ and the applied circuit field at $z=L$ is known. The remaining constraint can be taken as a matched circuit termination at one end.

The solutions can be expanded in terms of exponentials (i.e., four waves) or as power series in z. The former method has been used extensively by Pierce.[10] The power series method was originally presented by Kompfner[11] and has been recently extended by Quate[12] to include the effects of space charge and circuit loss; it is convenient in numerical solutions where the effective circuit length is small ($CN<0.4$). Although both solutions were used in this work, only the results of the wave-type solution will be presented in this section. The reformulation of the solutions in terms of power series is summarized in Appendix A.

Employing the exponential method of solution, $E(z)$ and $i(z)$ are each expanded as the sum of four waves. Γ_n is defined as the propagation constant of the nth wave and is the solution of the characteristic equation obtained from (1) and (2). Since the phase velocities of the perturbed waves are close to the dc beam velocity the propagation constants for backward waves can be written

$$\Gamma_n = j\beta_e(1 + jC\delta_n) \quad (3)$$

$$\Gamma_0 = -j\beta_e(1 + Cb + jCd), \quad (4)$$

where b is the velocity parameter and d is the loss parameter, as defined by Pierce.[13] In terms of the incremental propagation constant δ_n, the determinantal equation is the cubic

$$(\delta_n^2 + 4QC)(\delta_n + jb - d) = +j. \quad (5)$$

Here, terms of order C have been neglected compared with unity. Assuming that the circuit is matched at one end, the boundary conditions take the form

$$\sum_{n=1}^{3} E_n e^{-\Gamma_n L} = E(L)$$

$$\sum_{n=1}^{3} \frac{(\Gamma_n^2 - \Gamma_0^2)}{-\Gamma_0\Gamma_n^2K}E_n = i(0)$$

$$\sum_{n=1}^{3} \frac{(\Gamma_n - j\beta_e)(\Gamma_n^2 - \Gamma_0^2)}{j\beta_e\Gamma_0\Gamma_n^2K} = \rho_0 v(0). \quad (6)$$

The dc linear charge density is ρ_0.

After considerable manipulation and employing the following relations, derived from (5),

$$\delta_1 + \delta_2 + \delta_3 = -jb + d,$$

$$(\delta_1 + \delta_2)(\delta_2 + \delta_3)(\delta_3 + \delta_1) = -j, \quad (7)$$

the complete solutions for the "output" quantities can be written

$$E(0) = \frac{\kappa}{\Delta}E(L) - \frac{2V_0\beta_eC^2}{I_0}\frac{\Phi}{\Delta}i(0) + j\frac{u_0\beta_eC}{\eta}\frac{\chi}{\Delta}v(0) \quad (8)$$

$$i(L) = j\frac{I_0}{2V_0\beta_eC^2}\frac{\chi}{\Delta}E(L) - \frac{\Delta}{\Delta}i(0) - j\frac{I_0}{u_0C}\frac{\Psi}{\Delta}v(0) \quad (9)$$

$$v(L) = -\frac{\eta}{u_0\beta_eC}\frac{\Phi}{\Delta}E(L) + j\frac{u_0C}{I_0}\frac{\Omega}{\Delta}i(0) - \frac{\Delta}{\Delta}v(0). \quad (10)$$

---

[8] J. R. Pierce, "Traveling-Wave Tubes," D. Van Nostrand Co., New York; 1950.

[9] J. R. Pierce, *loc. cit.*, p. 17.

[10] J. R. Pierce, *loc. cit.*, ch. VII.

[11] R. Kompfner, "Traveling-wave tubes—centimetre-wav amplifier," *Wireless Eng.*, vol. 24, pp. 255–267; September, 1947.

[12] C. F. Quate, "Power Series Solution of Traveling-Wave Tub Equations," Bell Tel. Lab. Tech. Memo 53-1 500-36; October, 1953

[13] J. R. Pierce, *loc. cit.*, ch. VIII.

The coefficients are functions of the dc conditions of the beam, velocity b, circuit loss d, space-charge QC and circuit length. The following functions are defined

$$\kappa = (\delta_1 - \delta_2)(\delta_2 - \delta_3)(\delta_3 - \delta_1)$$

$$\chi = \sum_{i=1}^{3} (\delta_j - \delta_k) e^{2\pi CN\delta_i}$$

$$\Phi = \sum_{i=1}^{3} \delta_i(\delta_j - \delta_k) e^{2\pi CN\delta_i}$$

$$\Delta = \sum_{i=1}^{3} (\delta_i^2 + 4QC)(\delta_j - \delta_k) e^{2\pi CN\delta_i}$$

$$\Psi = e^{-j2\pi N} \sum_{i=1}^{3} (\delta_j^2 - \delta_k^2) e^{2\pi CN(\delta_j+\delta_k)}$$

$$\Lambda = e^{-j2\pi N} \sum_{i=1}^{3} \delta_i(\delta_j^2 - \delta_k^2) e^{2\pi CN(\delta_j+\delta_k)}$$

$$\Omega = e^{-j2\pi N} \sum_{i=1}^{3} \delta_i^2(\delta_j^2 - \delta_k^2) e^{2\pi CN(\delta_j+\delta_k)},$$

where i, j, k are taken as cyclic permutations of 1, 2, 3. N is the number of electronic wavelengths in circuit length L.

The linear relationships (8–10) express the output quantities in terms of the velocity, current and field which are impressed on the system. The coefficients constitute a general matrix for application in the succeeding calculations.

Simple Backward-Wave Amplifier

In this situation a smooth beam is injected from an electron gun directly into the interaction space; that is, no rf current or velocity modulation exists on the beam at the gun end of the circuit. As a result of the interaction process the circuit field builds up from its initial impressed value at $z=L$ to a maximum value at $z=0$ while the modulation induced on the beam increases in magnitude in the direction of electron flow. Analysis of this model applies to a single-helix amplifier or oscillator as well as to a beam modulator.

The power associated with the circuit is (for $C \ll 1$)

$$P(z) = \frac{1}{2\beta_e^2 K} E(z)E(z)^*. \tag{11}$$

From (8) an expression for the power gain of the above model can be written.

$$G = \frac{P(0)}{P(L)} = \left| \frac{\kappa}{\Delta} \right|^2. \tag{12}$$

For a fixed amount of space charge QC and circuit loss d it is possible to adjust the beam velocity b and the electrical length of the circuit CN so that the denominator in the above expression vanishes. This condition of infinite small-signal gain is unstable and is taken as the point at which oscillations start. Start-oscillation conditions have been computed for a wide range of operating parameters by others.[14–16]

The gain was plotted in Fig. 2 for values of beam current (I_0) below that at start-oscillation. Zero space charge and circuit loss were assumed for this representative curve and the gain has been optimized with respect to the velocity parameter b. The curve is fitted closely by the empirical relationship.

$$G = \left(1 - \frac{I_0}{I_{st}}\right)^{-2}. \tag{13}$$

It is seen that the backward-wave amplifier is capable of yielding very high values of gain. Because of the regenerative action, the tube characteristically possesses a very sharp frequency response, observed values of quality factor Q in the thousands having been reported.[17] The limitations on this amplifier have been discussed in an earlier section of the paper.

Backward-Wave Beam Modulator

Consider now the backward-wave circuit as a device for modulating a beam. From (9) and (10) the rf current and velocity modulation which are induced on the beam as a result of the interaction process are related to the input field by

$$i(z) = j \frac{I_0}{2V_0\beta_e C^2} \frac{\chi(z/LCN)}{\Delta(CN)} E_{in} \tag{14}$$

$$v(z) = \frac{-\eta}{u_0\beta_e C} \frac{\Phi(z/LCN)}{\Delta(CN)} E_{in}. \tag{15}$$

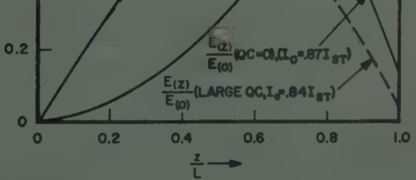


Fig. 12—Curves showing the build-up of current modulation and circuit field as a function of distance in a backward-wave modulator. The solid curves were calculated for $QC=0$, $d=0$. The dashed curves are approximate for large QC.

The relative values of rf current and field are shown as a function of distance in Fig. 12 (above) for the special

---

[14] H. Heffner, *loc. cit.*

[15] H. R. Johnson, "Backward-Wave Oscillators," Hughes Aircraft Company Tech. Memo. No. 361; May, 1954.

[16] W. A. Harman, "Backward-Wave Interaction in Helix-Type Tubes," Stanford E.R.L. Report No. 13; April, 1954.

[17] H. Heffner, "Backward-Wave Tubes," *Electronics*, vol. 26, pp. 135–137; Oct., 1953.

case of zero space charge and circuit loss. The curves are for a current of about 87 per cent of the starting value ($CN=0.30$) and for a value of b which optimizes the gain of the device as an amplifier.

As the circuit length is decreased and the current increased (in order to stay at a given value of CN) the inter-electronic Coulomb forces become more pronounced and some sort of limiting behavior might be expected. For large values of QC and zero circuit loss the incremental propagation constants assume particularly simple forms. The results show physically that only two waves need be considered. The interaction process can be described in terms of coupling between the circuit wave and the slow space-charge wave only. Limiting expressions for large values of QC (greater than about 0.25) are

$$E(z) \cong E(0) \cos\left[\frac{\pi}{2}\frac{CN}{\overline{\overline{CN}}}\frac{z}{L}\right] \tag{16}$$

$$|i(z)| \cong \frac{C}{\beta_e K}\frac{1}{\sqrt{2b}}\frac{\sin\left[\frac{\pi}{2}\frac{CN}{\overline{\overline{CN}}}\frac{z}{L}\right]}{\cos\left[\frac{\pi}{2}\frac{CN}{\overline{\overline{CN}}}\right]}|E(L)| \tag{17}$$

$$|v(z)| = \frac{2C^2}{\rho_0\beta_e K}\sqrt{\frac{b}{2}}\frac{\sin\left[\frac{\pi}{2}\frac{CN}{\overline{\overline{CN}}}\frac{z}{L}\right]}{\cos\left[\frac{\pi}{2}\frac{CN}{\overline{\overline{CN}}}\right]}|E(L)| \tag{18}$$

where $\overline{\overline{CN}}$ is the value of CN at start-oscillation,[18]

$$\overline{\overline{CN}} \cong \left(\frac{QC}{16}\right)^{1/4} \quad \text{and} \quad \frac{CN}{\overline{\overline{CN}}} \cong \left(\frac{I_0}{I_{st}}\right)^{1/4}. \tag{19}$$

Eqs. (16) and (17) are shown in Fig. 12 for operation at about 84 per cent of starting current. The ratio of $E(z)$ at $z=0$ and $z=L$ is just the voltage gain of the model when regarded as an amplifier. The curves indicate that the effect of space charge is to increase gain somewhat for a given (I_0/I_{st}). This effect is verified by more extensive calculations based on the exact relation (12).

The curves in Fig. 12 emphasize the fact that where the current modulation is weak the circuit field is strong, and vice versa; this is inherent in the nature of the interaction and differs markedly from the case of forward-wave interaction. These considerations suggest that backward-wave interaction is a relatively inefficient process. In particular, we are led to speculate on the possibility of securing a stronger reciprocal action between the beam and the circuit by somehow placing initial modulation on the beam so that interaction can commence with relatively large rf energy associated with both electrons and circuit. This is the situation to be discussed in the following section.

It is of interest to examine the nature of the modulation just as it leaves the interaction space. A descriptive parameter is the dimensionless ratio

$$\sigma(z) = \frac{Ci(z)}{\rho_0 v(z)} = \frac{j\chi(z/L\,CN)}{\Phi(z/L\,CN)}. \tag{20}$$

$\sigma(L)$ is shown in Fig. 13 (below) as a function of CN for $QC=0$, $d=0$ and optimum b. As effective length CN of interaction space increases the magnitude of $\sigma(L)$ also increases. The current modulation leads the velocity modulation (in the time sense) by an angle greater than 100 degrees, indicating that there is power carried by the stream. This is in contrast to a klystron in which the angle is 90 degrees and no rf power is carried by the stream. For the limiting case of large QC,

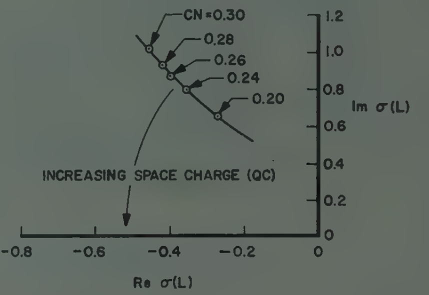


Fig. 13—The modulation on a beam at the output end ($z=L$) of a backward-wave modulator is described by the parameter $\sigma(L)=Ci(L)/\rho_0\sqrt{(L)}$. This parameter is shown on the σ-plane as a function of CN for $QC=0$, $d=0$. For this case the value of CN at start-oscillation is 0.314. The curve moves toward the (negative) real axis for increasing space charge (QC).

$$\sigma(L) \to -\frac{1}{b}, \tag{21}$$

where, in this case,

$$b \cong \sqrt{4QC}. \tag{22}$$

Therefore, increased current density causes the phase angle between current and velocity modulation at the end of the interaction space to increase and $|\sigma(L)|$ to decrease.

Backward-Wave Beam Demodulator

Referring to the model in Fig. 11, the case is now considered in which a beam is injected into the interaction space with both velocity and current modulation whose magnitudes and relative phases are arbitrary. The collector end of the circuit is assumed to be passively terminated in a matched load. Here we are primarily interested in the circuit field which is induced on the helix and, in particular, its value at the output terminals. From (8) and (20),

$$E(0) = -\frac{2V_0\beta_e C}{I_0}\frac{\rho_0 v_{in}}{\Delta}[\sigma_{in}\Phi + j\chi], \tag{23}$$

where v_{in} and σ_{in} describe the input modulation.

Since the induced field is strongly dependent upon the parameter σ_{in} and hence on the nature of the system employed in the original modulation of the beam, we shall examine several specific cases which are conceptually susceptible to experiment. First compare the backward-wave circuit with the output cavity of a klystron amplifier. In a simple klystron the cavity is located at a point of maximum current modulation along the stream. The bunched beam then induces a current flow in the cavity walls and excites it to resonance. An equivalent shunt resistance of the cavity can then be defined[19] which relates the power delivered to the resonator to the fundamental convection current component in the stream,

---

[18] W. A. Harman, *loc. cit.*, ch. III.

$$R_{sh} = \frac{2P}{i^2}\,. \tag{24}$$

A figure of merit for the cavity is usually taken as the ratio

$$\frac{R_{sh}}{Q} \sim \text{gain} \times \text{bandwidth}.$$

An upper limit for this ratio is roughly 100 with $R_{sh} \sim 100{,}000$ and $Q \sim 1{,}000$. R_{sh} can be increased at the expense of bandwidth, and vice versa.

Now consider a situation in which the klystron cavity is replaced by a backward-wave structure. The two arrangements are similar in several important respects. Both devices are narrow-band; both absorb energy from a bunched beam. The systems are on one hand resonant and on the other hand strongly regenerative in nature. For contrast it is of interest to define an effective shunt resistance for the backward-wave circuit for the case of pure current modulation at its input and to compare the resulting figure with that obtainable from a klystron cavity. From (11) and (23) the following expression is obtained:

$$(R_{sh})_{\text{eff.}} = \left(\frac{V_0}{2I_0}\right)^{2/3} K^{1/3} \frac{\Phi\Phi^*}{\Delta\Delta^*}\,. \tag{25}$$

Substitution of some conservative parameters ($V_0 \sim 500$ volts, $I_0 \sim 3$ ma, $K \sim 5$ ohms, $I_0 = 0.7\ I_{st}$) into the above relation indicates that an effective shunt impedance of 10^5 ohms can easily be obtained in practice. It will be shown that the corresponding Q in this range of operation is typically of the order of 400. As in the case of a klystron $(R_{sh})_{\text{eff.}}$ can be increased at the expense of bandwidth. A length of backward-wave circuit therefore represents a conceptual improvement over a reentrant-type resonator on the basis of their relative figures of merit. This is not surprising when the cumulative nature of the distributed interaction is considered; however, it does illustrate the effectiveness of a backward-wave demodulator in extracting energy from a bunched beam.

From these considerations it is seen that, in principle, an amplifier could be constructed which utilizes a reentrant cavity to modulate a beam and a periodic circuit as the output structure. Indeed, such an amplifier is entirely feasible and would appear to possess some advantages. This concept is important to the point of view which is developed in this paper.

The denominator in the expression for the field at the output of the demodulator is exactly the same as that which appears in the gain expression for a simple backward-wave amplifier. This implies that, for identical circuits, the condition of instability (i.e., start-oscillation) occurs at the same point and is independent of externally applied fields.

The Severed-Helix Backward-Wave Amplifier

We shall now examine the behavior of a demodulator section when the input modulation has the same characteristic as that possessed by a beam at the output of a backward-wave modulator. The model to be analyzed is that of Fig. 1, discussed earlier, but with the drift distance approaching zero. The principal idealization is then that the two helices are completely isolated from one another and that no coupling between them exists in the absence of the electron beam.

The power output of the second helix is found to be

$$P_{\text{out}} = \frac{1}{(2K)^{1/3}} \left(\frac{V_0}{I_0}\right)^{4/3} \left| \rho_0 (v_{\text{in}})_2 \right|^2 \frac{\left| (\sigma_{\text{in}})_2 \Phi_2 + j\chi_2 \right|}{\left| \Delta_2 \right|^2}, \tag{26}$$

where the added subscripts (2) denote quantities pertaining to the second helix and $(\sigma_{\text{in}})_2$ describes the beam modulation at its entrance. From (15) the velocity modulation at the output of the first helix is

$$\left| \rho_0 (v_{\text{out}})_1 \right|^2 = (2K)^{1/3} \left(\frac{I_0}{V_0}\right)^{4/3} \left| \frac{\Phi_1}{\Delta_1} \right| P_{\text{in}}, \tag{27}$$

and, in this case, with no separation between circuits and no velocity jump, the continuity of velocity and current is expressed by

$$(\sigma_{\text{out}})_1 = (\sigma_{\text{in}})_2, \quad (\rho_0 v_{\text{out}})_1 = (\rho_0 v_{\text{in}})_2. \tag{28}$$

The gain expression for the severed-circuit amplifier becomes

$$G = \left| \frac{\chi_1 \Phi_2 + \chi_2 \Phi_1}{\Delta_1 \Delta_2} \right|^2. \tag{29}$$

The simplest case results when both helices are the same physical length (it has been assumed implicitly that they are identical in all other respects). This is also the case of greatest interest. Since the start-oscillation point is the same for each section, unequal lengths would mean that one section is operating closer to oscillation than the other. This is usually undesirable. For operation at a specified fraction of starting current, maximum gain will be obtained for equal circuit lengths and synchronous tuning. In this case the over-all gain is

$$G = \left| \frac{2\Phi\chi}{\Delta^2} \right|^2. \tag{30}$$

---

[19] K. R. Spangenberg, "Vacuum Tubes," McGraw-Hill Book Co., New York, p. 535; 1948.

For stagger-tuning or dissimilar input and output circuits, (29) can be used to compute gain. The gain expressions in terms of power series can be found from Appendix A.

Gain is shown as a function of the velocity parameter b in Fig. 14 for $QC=0$, $d=0$. The curves are plotted for various lengths (CN) of the circuits. For CN greater than about 0.24 ($I_0 > 0.5 I_{st}$) the magnitude of b at maximum gain is fairly constant. Maximum gain therefore occurs at approximately constant percentage deviation of the beam velocity from that of the unforced circuit wave, regardless of the gain level. The curves also display a lack of symmetry around the point of maximum gain which has been experimentally observed.

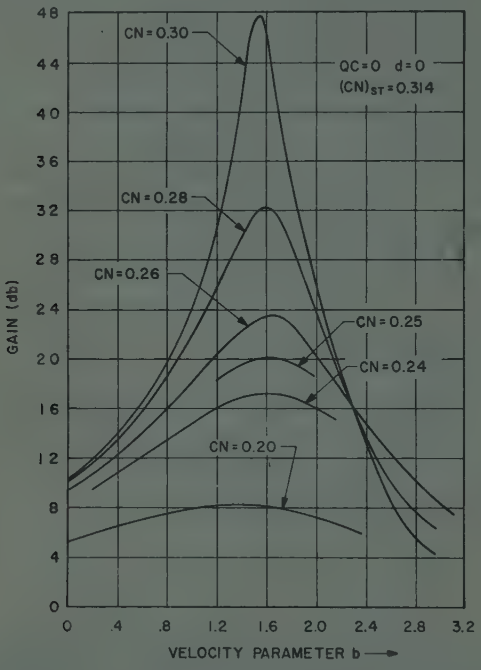


Fig. 14—Curves showing the gain of a severed-helix backward-wave amplifier (zero drift length between input and output circuits) as a function of the velocity parameter b. The input frequency is held constant. These curves are for $QC=0$, $d=0$; CN at start-oscillation is equal to 0.314. Identical input and output circuits are assumed.

Since there is a one-to-one correspondence between velocity and frequency, Fig. 14 illustrates the reciprocal relation between gain and bandwidth. From the definition of b,

$$\Delta b \cong \frac{1}{C}\,\frac{\Delta v_p}{v_p} \sim \frac{1}{C}\,\frac{\Delta f}{f}, \tag{31}$$

so that the velocity width Δb is proportional to the bandwidth. For a tape helix the phase velocity of the domiuant backward-wave harmonic is[20]

$$v_p \cong \frac{ka\sqrt{\mu\epsilon}\,\tan\psi}{D - ka},$$

where ψ is the pitch angle of the helix, ka is the ratio of circumference to free-space wavelength and D is the dielectric loading factor.[21] Therefore

$$\Delta b \cong \frac{D}{ka}\,\frac{\Delta(ka)}{(D - ka)}, \tag{32}$$

and the bandwidth becomes

$$\Delta f \cong Cf\left(1 - \frac{ka}{D}\right)\Delta b, \tag{33}$$

where Δb is interpreted as the spread of the gain curves at the half-power points.

An equivalent Q of the amplifier can be defined

$$Q = \frac{f}{\Delta f} \cong \frac{1}{C\left(1 - \dfrac{ka}{D}\right)\Delta b}. \tag{34}$$

For example, at $ka=0.5$, $I_0=0.7\,I_{st}$, $C=0.01$ and $D=1$, an equivalent Q of approximately 400 will be realized. A higher Q at a given gain level can be obtained by decreasing the beam-helix coupling and going to longer lengths of helix (at the same CN). Alternatively, operation at higher beam voltages, lower currents, and the use of more dispersive backward-wave circuits could be employed.

For the case of large space charge (QC), the circuit field at the output of the demodulator section can be written

$$E_{\text{out}} \sim \frac{\beta_e K}{2C^2}(\rho_0 v_{\text{in}})_2\sqrt{\frac{2}{b}}\,\tan\left[\frac{\pi}{2}\,\frac{CN}{\overline{\overline{CN}}}\right]. \tag{35}$$

Using (18), the over-all gain then becomes approximately

$$G \cong \tan^4\left[\frac{\pi}{2}\left(\frac{I_0}{I_{st}}\right)^{1/4}\right]. \tag{36}$$

In Fig. 15 (opposite page), gain of severed-helix tube, optimized with respect to b, is shown as a function of current for limiting cases of large and small space charge (zero loss). The curves are universal. That is, starting current I_{st} can be separately calculated as a function of frequency in any specific case. The rapid rise of the curves from the region of negative gain indicates the strong interaction which occurs in the demodulator. A curve for $L_1 = \frac{1}{2}L_2$ illustrates the desirability of using circuits of equal length.

A comparison of the characteristics of the idealized severed-helix tube with those of the simple backward-wave tube has already been given. A typical calculation ($I_0=0.7\,I_{st}$, $QC=0$, $d=0$) shows that where the latter device produces a gain of 11 db, the "gain" of the modulator-demodulator configuration is about 32 db. In order to put the comparison on a fairer basis it should be recognized that the composite system employs two circuits each having an electrical length equal to that of the single circuit in the conventional tube. It might be more realistic to compare the gain of the composite structure with the gain obtained when two single-circuit tubes are cascaded. A comparison on this basis shows that the former arrangement still offers higher gain, 32 db as compared with 22 db. This comparison is valid for equal values of operating current if the circuits are identical in each case.

---

[20] M. R. Currie, "The Electronic Impedance Characteristics of Waves on a Helix," Tech. Rep. No. 60, E.R.L., University of California; April 1, 1954.

[21] P. K. Tien, "Traveling-wave tube helix impedance," PROC. IRE, vol. 41, pp. 1617–1623; November, 1953.

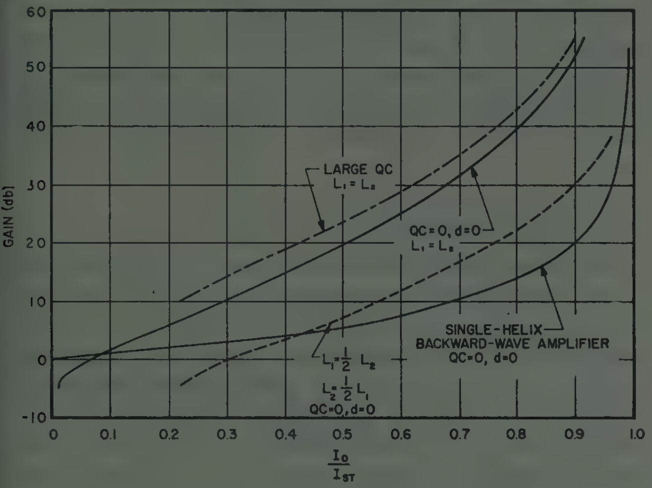


Fig. 15—Gain curves for the severed-helix backward-wave amplifier as a function of current normalized to the start-oscillation current. L_1 and L_2 denote the lengths of the input and output circuits, respectively. The gain has been optimized with respect to the velocity parameter b. The gain of a single-circuit backward-wave amplifier is shown for comparison.

The physical explanation of this behavior follows from Fig. 12 and the earlier discussion. In the usual case an unmodulated beam enters the interaction space where the circuit wave is strongest; conditions for strong interaction are not optimum. In the modified arrangement the modulation induced during the beam's transit through the first circuit is immediately placed in the region of maximum field on the second circuit. An enhanced reciprocal interaction between the beam and this circuit results.

Cascade Backward-Wave Amplifier with Drift Space

The idealized model probably could not be realized very closely in practice. Two circuits placed immediately adjacent to each other would prohibit good input and output matching and their fringing fields would not yield the high degree of cold isolation which is desired. In a more practical model to be considered, the circuits are separated by an arbitrary structure. A general configuration is shown in Fig. 16(a). The function of the new element or transducer is not only to isolate the input and output circuits but also to transform the velocity and current modulation which exist on the beam at the end of the first section so as to optimize the output signal. In the general case the transducer could consist of any combination of propagating and nonpropagating circuits.

The simplest transducer section consists of a region in which the electrons drift at constant velocity, as was considered in Fig. 1. Although this constitutes an analogy with the klystron, the drift tube here is not essential to the bunching mechanism. The effect of the drift tube on the over-all gain can be simply determined under the assumption that only one mode is excited in this region by the input modulation (denoted i_a and v_a). In this case the transformation to new values i_b and v_b can be described in terms of the space-charge waves of a single mode; the drift region can be regarded as a passive and lossless two-terminal pair network. The validity of the above assumption depends upon the particular geometry of the structure. For a helix circuit and a hollow beam it appeared to be good experimentally.

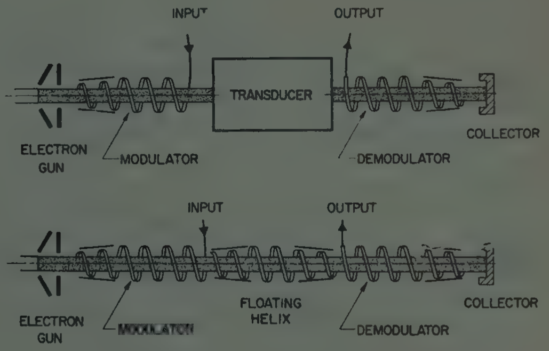


Fig. 16—Schematic models of the cascade backward-wave amplifier. (a) A general configuration in which the modulator and demodulator sections are separated by an arbitrary structure or space-charge wave transducer. (b) The floating helix amplifier in which the center section consists of a circuit terminated at each end. The helices could be replaced by any periodic circuits.

The output modulation is related to the input modulation by the following equations:

$$i_b = i_a\left[\cos\theta_q - j\frac{\sigma_0}{\sigma_a}\sin\theta_q\right], \tag{37}$$

$$\rho_0 v_b = \rho_0 v_a\left[\cos\theta_q - j\frac{\sigma_a}{\sigma_0}\sin\theta_q\right]; \tag{38}$$

where

$$\theta_q = \frac{\omega_p}{u_0} Rd \text{ (radian length of drift tube),}$$

$$\sigma_a = \frac{Ci_a}{\rho_0 v_a},$$

$$\sigma_0 = -\left(\frac{C}{R}\,\frac{\omega}{\omega_p}\right). \tag{39}$$

The particular beam and drift-region configuration is accounted for by the plasma frequency reduction factor R. This parameter is evaluated in Appendix B for the case of a hollow beam possessing modulation characteristic of the backward wave on a helix. If σ_0 is regarded as the "characteristic impedance" of the drift region, i_a, v_a, and σ_a transform exactly as voltage, current and impedance along a transmission line; the usual calculation techniques (e.g., Smith chart) can be applied.

For the simple case of identical input and output circuits the over-all gain is given by

$$G = \left| \frac{2\Phi\chi}{\Delta^2} \right|^2 HH^*, \tag{40}$$

where

$$H = \cos\theta_q - j\frac{\sin\theta_q}{2}\left(\frac{\sigma_a}{\sigma_0} + \frac{\sigma_0}{\sigma_a}\right). \tag{41}$$

The first factor in (40) is just the gain of the idealized severed-helix tube; the factor HH^* represents the effect of the drift region on the over-all gain of the device.

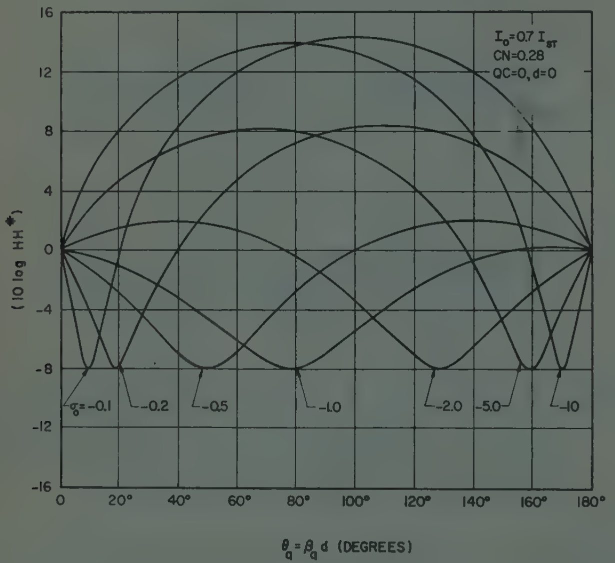


Fig. 17—Curves showing the effect of a drift region on the gain of a cascade backward-wave amplifier. The ordinate is the db correction to the gain of the severed-helix amplifier; the abscissa is the length of the drift region in degrees (one plasma wavelength is equal to 360 degrees). The parameter is the drift-tube "characteristic impedance" $\sigma_0 = -(C\omega/\omega_q)$. Identical input and output circuits are assumed and the calculations are for $I_0 = 0.7\ I_{st}$, $QC = 0$, and $d = 0$.

In Fig. 17 some representative curves of HH^* (expressed in db) are given as a function of drift tube length for various σ_0. Although these curves are for operation at 70 per cent of starting current it is found that they do not change significantly with the ratio I_0/I_{st}. It is apparent that a drift tube can increase the over-all gain for magnitudes of σ_0 either much greater or much smaller than unity. The former condition could only be met at the higher frequencies (e.g., X-band and above) and with the beam grazing the drift tube so as to lower the value of R.

For typical operation of helix-type backward-wave tubes at S-band, σ_0 may have a value near -1. In this range nearly all drift lengths result in a subtraction from the net gain. However, the magnitude of gain is often only of secondary importance in such a tube. For example, in the application of the tube as a swept amplifier it may be more important to maintain reasonably constant gain as a function of frequency at a constant value of beam current. The gain of the severed-helix tube (at small QC) is a function only of normalized current (I_0/I_{st}). Since I_{st} generally increases with frequency the gain at constant current will decrease at the higher frequencies. The choice of drift distance therefore lends an additional degree of freedom to the design of the tube. In particular, referring to Fig. 17, it is seen that this region can be made to compensate the above effect and the over-all gain can be made more constant with frequency. This compensating action was observed in the experimental amplifier discussed earlier. In this sense, the drift region can be regarded as a gain equalizer.

The Floating Helix Model

Another simple transducer section consists of a backward-wave circuit terminated at each end in a lossy match as shown in Fig. 16(b). In analogy to the floating cavity klystron this configuration is termed the floating helix amplifier. The analogy is only superficial since, in this case, the floating helix plays an active role in the energy balance. It absorbs energy while imparting further modulation to the beam. In the limit, this configuration may consist of an arbitrary number of floating circuits between the modulator and demodulator with each contributing to the over-all gain of the tube. The bandwidth can be adjusted to some degree by stagger tuning these elements.

For the case in which the floating circuit is identical to the input and output circuits, the over-all gain is given by

$$G = \left| \frac{2\Phi\chi}{\Delta^2} \right|^2 JJ^*, \tag{42}$$

where

$$J = \frac{1}{\Delta}\left[-\Lambda + \frac{1}{2}\left(\frac{\Phi^2\Psi + \chi^2\Omega}{\Phi\chi}\right)\right]. \tag{43}$$

The factor JJ^* expresses the contribution of the floating circuit to the gain of the idealized model. Numerical calculations for small QC show that at $I_0/I_{st} = 0.5$ the gain is increased by about 9 db and, at $I_0/I_{st} = 0.7$, the new element adds about 19 db. Calculations for unequal circuit lengths or multiple floating circuits can be readily formulated in matrix notation based on the linear relationships (8), (9) and (10).

Noise Figure

In considering the application of the cascade backward-wave amplifier as a small-signal device it is important to know its noise figure, i.e., its capability of detecting extremely low signal levels. The minimum detectable signal is limited by random fluctuations of the electrons and the conversion of these fluctuations to noise power on the circuit at the tube's output. A theoretical minimum noise figure for conventional traveling-wave tubes has been calculated recently[22,23] and actually has been exceeded in practice (this discrepancy is attributed to incomplete knowledge of conditions at the potential minimum). A similar analysis will be presented for the cascade amplifier.

Noise figure can be defined[24] as the ratio of the noise-to-signal power ratio at the output N_0/S_0, to that at the input N_i/S_i, i.e.,

$$F = \frac{N_0/S_0}{N_i/S_i} = \frac{N_0}{N_iG}, \tag{44}$$

where G is the over-all gain. The tube is assumed to be matched to a source at temperature T; N_i is the available thermal noise power

$$N_i = kTB,$$

where k is Boltzmann's constant and B is frequency bandwidth. The total noise power at the output is

$$N_0 = N_{0b} + N_{0t}.$$

N_{0b} is power due to noise on the beam and N_{0t} is thermal noise power. For the cascade amplifier

$$N_{0t} = kTBG + kT_2B_2G_2. \tag{45}$$

The second term represents the contribution of the output circuit when considered as a single-circuit backward-wave amplifier *per se*. Its input (collector end) is matched to a temperature T_2; B_2 and G_2 are, in general, different than the corresponding values for the composite tube. Another term would be required for the case of a floating circuit tube. The noise figure becomes

$$F = 1 + \frac{B_2G_2T_2}{BGT} + \frac{1}{kTB}\,\frac{N_{0b}}{G}. \tag{46}$$

Assuming a single-valued-velocity flow, the output power due to rms velocity fluctuations $\tilde{v}$ and current fluctuations $\tilde{\imath}$ at the input of the modulator section can be calculated from equations previously given. Two sources of noise exist at the potential minimum near the cathode, namely, velocity fluctuations

$$\tilde{v}_a = \sqrt{4-\pi}\left(\frac{\eta kT_cB}{I_0}\right)^{1/2},$$

and full shot noise.

$$\tilde{\imath}_a = \sqrt{2eI_0B}.$$

Under the assumption that these are completely uncorrelated, each will set up fluctuations in velocity and current at the entrance to the interaction space; the fluctuations due to the two noise sources will be uncorrelated and will produce powers which add at the tube's output. The resultant noise figure of the drift-tube configuration can be written

$$F = 1 + \frac{B_2G_2T_2}{BGT} + \frac{I_0}{4V_0CkTB}$$
$$\sum_{i=1,2}\left|\left(\frac{u_0}{\eta}\right)\frac{(\Phi\Psi-\chi\Lambda)+\dfrac{1}{\sigma_0}\tan\theta_q(\chi\Psi+\sigma_0{}^2\Phi\Lambda)}{2\Phi\chi+\dfrac{1}{\sigma_0}\tan\theta_q(\chi^2-\sigma_0{}^2\Phi^2)}\,\tilde{v}_i\right.$$
$$\left.+\,j\left(\frac{2V_0C}{I_0}\right)\frac{(\chi\Omega-\Phi\Lambda)-\dfrac{1}{\sigma_0}\tan\theta_q(\chi\Lambda+\sigma_0{}^2\Phi\Omega)}{2\Phi\chi+\dfrac{1}{\sigma_0}\tan\theta_q(\chi^2-\sigma_0{}^2\Phi^2)}\,\tilde{\imath}_i\right|^2, \tag{47}$$

where the subscripts $i=1, 2$ represent quantities due to $\tilde{v}_a$ and $\tilde{\imath}_a$, respectively.

In order to evaluate the noise figure the quantities $\tilde{v}_1$, $\tilde{\imath}_1$ and $\tilde{v}_2$, $\tilde{\imath}_2$ must be related to the noise sources at the potential minimum. This can be done in any specific case by means of the Llewellyn-Peterson equations. The noise figure is then a function of the electron gun dimensions and of the distance from the final anode to the circuit entrance. This procedure has been generalized[25,26] by assuming an arbitrary lossless space-charge-wave transducer between the potential minimum and the circuit entrance. If the noise figure is written in the form

$$F = 1 + \frac{I_0}{4V_0CkTB}\cdot\sum_{i=1,2}\left|\left(\frac{\mu_0}{\eta}\right)\alpha\tilde{v}_i - j\left(\frac{2V_0C}{I_0}\right)\sqrt{4QC}\,\beta\tilde{\imath}_i\right|^2, \tag{48}$$

then F can be minimized with respect to the transducer's characteristic parameters. The formal analyses given in the above references are applicable to backward-wave amplifiers as well as to conventional forward-wave amplifiers. From the results of these analyses the following expression for minimum noise figure can be obtained:

$$F_{\min} = 1 + 2\frac{T_c}{T}\sqrt{4-\pi}\,|\,a_2b_1 - a_1b_2\,|, \tag{49}$$

where

$$\alpha = a_1 + ja_2; \qquad \beta = \frac{1}{\sqrt{4QC}}(b_1 + jb_2). \tag{50}$$

Slightly different forms for $F_{\min}$ result from choosing other methods of averaging the velocity fluctuations at the potential minimum.[27]

---

[22] J. R. Pierce and W. E. Danielson, "Minimum noise figure of traveling-wave tubes with uniform helices," *Jour. Appl. Phys.*, vol. 25, pp. 1163–1165; September, 1954.

[23] R. Peter and S. Bloom, "A minimum noise figure for the traveling-wave tube," *RCA Rev.*, vol. 15, pp. 252–267; June, 1954.

[24] R. W. Peter, "Direct-reading noise-factor measuring systems," *RCA Rev.*, vol. 12, pp. 269–281; June, 1951.

[25] J. R. Pierce and W. E. Danielson, *loc. cit.*

[26] R. Peter and S. Bloom, *loc. cit.*

[27] J. R. Pierce, "A theorem concerning noise in electron streams," *Jour. Appl. Phys.*, vol. 25, p. 931; August, 1954.

Comparison of (47) and (48) yields values of α and β appropriate for cascade amplifier. In usual range of operation, B_2 is slightly greater than B (at same current) and $G_2 \ll G$ (Fig. 15). Second term in (47) is small and thus can be neglected to good approximation.

The minimum noise figure has been computed for various values of circuit loss as a function of QC. In order to simplify the calculations, the tabulated conditions at start-oscillation were used. This procedure yields results which are strictly valid only at the point of infinite gain. The results are shown in Fig. 18. Certain features of the curves are worth comment. For zero loss the minimum noise figure is exactly the same as for a forward-wave amplifier, namely,

$$F = 1 + (0.9265)\frac{T_c}{T} \sim 6 \text{ db}.$$

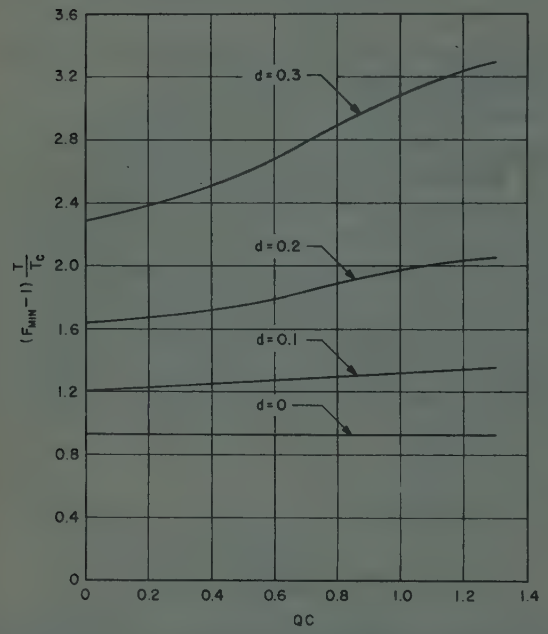


Fig. 18—The minimum noise figure $F_{\min}$ of the cascade backward-wave amplifier can be determined from the above curves. The curves are given for four values of the attenuation parameter d. Identical curves were obtained for drift lengths of 0, $\frac{1}{8}\lambda_q$, and $\frac{1}{4}\lambda_q$ and for a single-helix backward-wave amplifier.

But noise figure in backward-wave case is much more strongly dependent upon circuit loss than a forward-wave amplifier. Moreover, in the latter, $F_{\min}$ can be lowered by decreasing value of d over only first several circuit wavelengths; for backward-wave circuit, d must be minimized over its entire length.

In each case the curves were computed for three lengths of drift tube $(0, \frac{1}{8}\lambda_q, \frac{1}{4}\lambda_q)$ and $\sigma_0 = -1$. Exactly the same values of $F_{\min}$ were obtained in each case. Thus, at high gain, the noise figure is determined only by the parameters of the modulator section (if the thermal noise of the output circuit is neglected). The signal-to-noise ratio is fixed as the beam leaves the modulator. Therefore, the curves also give the minimum noise figure of a single-circuit backward-wave amplifier. The latter has been recently computed independently[28] and agrees with the above results. Detailed calculations for operation at low gain levels indicate minimum noise figures slightly below those shown in Fig. 18.

APPENDIX A: POWER SERIES SOLUTIONS

Quate[29] recently solved the traveling-wave tube differential equations by expanding the solutions in the form of power series. This type of solution is convenient for electrically short circuits where all three waves must be taken into account. It is therefore ideal for backward-wave tubes. When Quate's expressions are transformed to the case of backward waves and put into the same form as (8)–(10), the functions used in this paper can be replaced by power series as follows:

$$\frac{\kappa}{\Delta} = \frac{1}{S_a} \qquad \frac{\Lambda}{\Delta} = S_d - j\frac{S_b S_c}{S_a}$$
$$\frac{\Phi}{\Delta} = \frac{S_b}{S_a} \qquad \frac{\Psi}{\Delta} = S_e - j\frac{S_c^2}{S_a}$$
$$\frac{\chi}{\Delta} = \frac{S_c}{S_a} \qquad \frac{\Omega}{\Delta} = -\left[S_f + j\frac{S_b^2}{S_a}\right], \tag{51}$$

where the power series are given by

$$S_a = \epsilon^{-j(\tau b/2)}\left[\epsilon^{-j(\tau b/2)} + j\frac{\tau^3}{3^1.} - j\frac{\tau^5}{5^1.}\left(\frac{f^2}{2} + 4QC\right) - \frac{\tau^6}{6^1.}(1 - 4QCf) + \cdots\right]$$

$$S_b = \tau - j\frac{\tau^2}{2^1.}f - \frac{\tau^3}{3^1.}(f^2 + 4QC) + j\frac{\tau^4}{4^1.}(f^3 + 1 + 4QCf) + \frac{\tau^5}{5^1.}(f^4 + 2f + 4QCf^2 + (4QC)^2) + \cdots$$

$$S_c = \frac{\tau^2}{2^1.} - j\frac{\tau^3}{3^1.}f - \frac{\tau^4}{4^1.}(f^2 + 4QC) + j\frac{\tau^5}{5^1.}(f^3 + 1 + 4QCf) + \cdots$$

$$S_d = \cos(\tau\sqrt{4QC}) + j\frac{\tau^3}{3^1.} + \frac{\tau^4}{4^1.}f - j\frac{\tau^5}{5^1.}(f^2 + 8QC) - \cdots$$

$$S_e = \frac{1}{\sqrt{4QC}}\sin(\tau\sqrt{4QC}) + j\frac{\tau^4}{4^1.} + \frac{\tau^5}{5^1.}f - j\frac{\tau^6}{6^1.}(f^2 + 8QC) + \cdots$$

$$S_f = \sqrt{4QC}\sin(\tau\sqrt{4QC}) - j\frac{\tau^2}{2^1.} - \frac{\tau^3}{3^1.} f + j\frac{\tau^4}{4^1.}(f^2 + 8QC) + \frac{\tau^5}{5^1.}(f^3 + 8QCf + 1) + \cdots,$$

---

[28] T. E. Everhart, "Concerning the Noise Figure of a Backward-Wave Amplifier," Hughes Aircraft Co. Rep. 40-31-00-3; Oct., 1954.

[29] C. F. Quate, *loc. cit.*

vhere

$$\tau = 2\pi CN \quad \text{and} \quad f = b + jd.$$

The series are particularly useful for zero loss and small QC. They converge fairly rapidly for $b<2.5$. Many of the exploratory calculations in this paper employed the series; the authors are indebted to C. F. Quate for pointing out this method of solution.

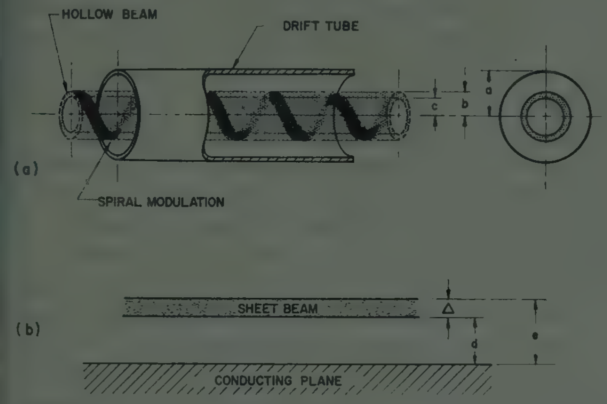


Fig. 19—Drift-tube configuration used for analysis. (a) The exact cylindrical model in which a hollow beam enters the drift tube with a spiral modulation pattern characteristic of interaction with the (-1) harmonic of a helix. (b) An approximate planar model in which a sheet beam passes close to a conducting plane.

Appendix B: Plasma Frequency Reduction Factor

The configuration of the beam and drift region entered the analysis implicitly in the plasma frequency reduction factor R. It accounts for the change in plasma frequency due to the finite size of the beam and the effects of charges induced on nearby metal surfaces. R is defined[30]

$$R = \frac{\omega_q}{\omega_p} = \left[\frac{1}{1 + \dfrac{T^2}{\beta_e^2}}\right]^{1/2}, \tag{52}$$

where T is a characteristic value of the differential equation

$$\Delta_t^2 E_z + T^2 E_z = 0. \tag{53}$$

The T for the mode encountered with helix-type backward-wave tubes has not been previously evaluated and is given here. The modulation induced on the beam by interaction with the backward space harmonic of the helix is not axially symmetric; the fields of this component propagate as $\exp j[\omega t - |\beta_{-1}|z - \theta]$. If viewed in a plane of constant z the fields have a sinusoidal variation with azimuth. As the beam enters the drift region it possesses a spatial modulation pattern which is a spiral as shown above, Fig. 19(a). It is assumed that only fields having this same angular variation will be excited in the drift tube. The solution to (53) is then in terms of first-order Bessel functions and their derivatives; T is the solution of a transcendental equation involving these functions.

The complicated nature of the characteristic equation for T makes its extensive evaluation as a function of geometry and beam velocity difficult. For hollow beams of radial thickness small compared with diameter, it can be assumed that electrons will not experience drastic effects due to the curvature of the drift tube. An approximate model therefore consists of an infinite sheet beam passing close to a conducting plane, as in Fig. 19(b). The spiral modulation pattern is then replaced by a pattern characteristic of the (-1) harmonic on a developed helix, i.e., the wave propagates as $\exp j[\omega t - |\beta_{-1}|z + y/a]$ so that the fields repeat at $y = 2\pi na$. The determinantal equation then becomes simply

$$\tanh(\eta d) = \frac{\eta/T' \tan T'\Delta + 1}{T'/\eta \tan T'\Delta - 1}, \tag{54}$$

where $T' = \sqrt{T^2 - (1/a)^2}$, $\eta^2 \cong \beta e^2 + (1/a)^2$, and the equivalence between the cylindrical and planar models is given by

$$\frac{\Delta}{a} = \frac{b - c}{a}, \qquad \frac{d}{a} = 1 - b/a.$$

Eq. (54) can be shown to be the limiting form of the exact cylindrical equation when asymptotic approximations of the Bessel functions are inserted.

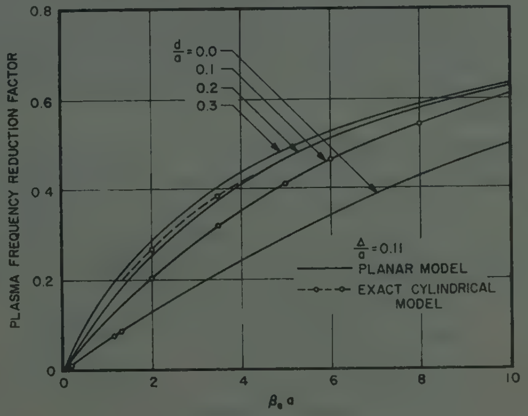


Fig. 20—Curves of plasma-frequency reduction factor versus ratio of helix diameter to electronic wavelength for various radial separations of the beam from the drift tube. The dimensions are defined in Fig. 19. Calculations based on the cylindrical and planar models show good agreement.

A typical curve of R as a function of $(\beta_e a)$ is shown in Fig. 20. The value of Δ/a corresponds to that of the experimental tube. The circled points were calculated from the cylindrical solution and illustrate the usefulness of the planar model. In the range of $(\beta_e a)$ typically encountered in helix-type backward-wave tubes (about 4 to 8) values of R under 0.5 are easily obtained and decrease as the beam is made to pass closer to the drift tube.

---

[30] S. Ramo, "The electronic wave theory of velocity modulation tubes," Proc. IRE, vol. 27, pp. 757–763; December, 1939.

Junction Transistor Blocking Oscillators*

J. G. LINVILL†, ASSOCIATE MEMBER, IRE, AND R. H. MATTSON†

Summary—**Blocking oscillators are useful as generators of rectangular pulses. Though junction transistors with alpha cutoff frequencies of a few megacycles have been most frequently used for low-frequency applications, they make surprisingly fast blocking oscillators. Rise times shorter than 0.1 microsecond have been analytically predicted and experimentally obtained.**

A simple but experimentally verified analysis indicates the proper transformer design for best rise time and prescribed pulse width. Using extensions of the primary results, one can evaluate triggering requirements and the effect of loading on the oscillator performance. Experimental results support these extensions.

INTRODUCTION

BLOCKING oscillators using triode junction transistors are useful for many applications. With only minor modifications, the basic blocking oscillator circuit can be used as a regenerative pulse amplifier, ring counter stage, pulse generator, or frequency divider stage. Junction transistors with alpha cutoff frequencies of a few megacycles ordinarily used for low-frequency applications make surprisingly fast blocking oscillators. Analysis predicts and experimental results confirm that such transistor blocking oscillators can provide output pulses with rise times of a tenth microsecond.

The crux of the design of a blocking oscillator, Fig. 1, which is essentially a one-stage amplifier with regenerative transformer coupling, is the choice of the feedback transformer. It is chosen to minimize the rise and fall times of the output pulse and deliver the desired pulse width.

This paper presents an analysis of transistor blocking oscillator performance, on the basis of which one can design a blocking oscillator for most rapid switching times and the desired pulse width. The analysis also compares the effectiveness of different trigger pulses in initiating the oscillator cycle. Finally an analysis of the effects of loading the blocking oscillator is shown.

THE BLOCKING OSCILLATOR AND ITS NETWORK APPROXIMANTS

A typical transistor blocking oscillator is shown in Fig. 1. It can be made either free-running or driven by choice of the voltage V_r. The essential elements found in blocking oscillators are the active element, in this case a transistor, and the transformer. There are a number of variations possible in the arrangement of the transformer connections which do not significantly alter the operation of the oscillator. For instance, the transistor can appear in a common-emitter orientation with feedback from collector to base. The emitter bias arrangement shown is another of the possibilities. The resistance R and the capacitance C are of significance in determining the frequency of operation and are chosen so as not to influence appreciably the performance of the oscillator during its output pulse. A pulse source is shown at the emitter of the transistor which is used either to trigger the transistor in the driven case or to synchronize it in the free-running case.

The presence of diode D_1 insures that the transistor never reaches the condition of saturation; it must always have a collector-to-base voltage of at least V_1. The prevention of saturation, effected by D_1, avoids difficulties associated with storage[1] of minority carriers in the base of the transistor in the condition of saturation and permits one to deal with the circuit as if the diodes are either open or short circuits and with the transistor as a simple linear amplifier when its emitter is carrying current in the forward direction. Diode D_2 protects the collector junction from high voltages caused by the inductance of the transformer at the termination of the output pulse.

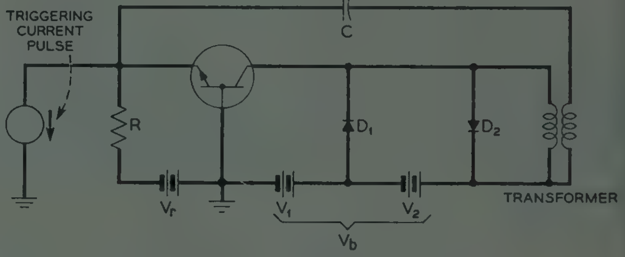


Fig. 1—A typical transistor blocking oscillator.

In terms of Fig. 1, the sequence of operations of the blocking oscillator for a cycle is as follows. At the end of the quiescent period, just as the trigger pulse starts, the emitter is back-biased and the collector voltage is V_b. The trigger pulse causes current to flow in the emitter, and at this point the transistor becomes active. After a short time the emitter current is substantially all collected by the collector and by virtue of the transformer a much larger emitter current is drawn in the same direction as that initiated by the trigger pulse. It is desirable to select a transformer with suitable turns ratio to lead to the fastest build-up of current in the transistor. As will be seen, the diffusion delay, collector capacitance, and leakage inductance, along with the transistor parameters all need to be considered. As the current build-up proceeds, the collector voltage drops from V_b until it reaches V_1 when diode D_1 begins con-

---

* Original manuscript received by the IRE, May 5, 1955; revised manuscript received, June 16, 1955.

† Bell Telephone Labs., Inc., Murray Hill, N. J.

[1] J. L. Moll, "Large-signal transient response of junction transistors," PROC. IRE, vol. 42, 1773–84; December, 1954.

duction. At this point the circuit regeneration is stopped and the sequence associated with switching ON is complete. The collector voltage remains at V_1 and the diode D_1 merely carries an amount of current to satisfy Kirchhoff's current law at the collector node. However, one observes that the magnetizing inductance of the transformer is in parallel with D_1 and at this stage has a steady voltage V_2 across it. Therefore, the current through this magnetizing inductance simply builds up linearly and there is a corresponding decrease in the current carried by D_1. The end of the ON period of the pulse comes when the current in D_1 has dropped to zero. At this point the remainder of the circuit cannot support the growing current required by the magnetizing inductance at the voltage V_2, so this voltage starts to decrease. D_1 opens and the collector voltage starts to rise. There follows in reverse the sequence of events that came with the switching action just described, and the result is that the transistor is switched off. When the voltage at the collector is back again to V_b, diode D_2 prevents any further rise and the magnetizing inductance is discharged through it. By virtue of the charge stored on the condenser C during the pulse, the emitter is again biased off even in the free-running case and a recharging from V_r through R must occur before the cycle is repeated.[2] In the case of the driven blocking oscillator, the value of V_r is such that the transistor will not begin to conduct again until a new triggering pulse is applied.

On the basis of the preceding discussion, it is clear that the blocking oscillator goes through three distinct operations during a cycle. There are the switching periods when the circuit is regenerative and unstable, the ON period when D_1's current is being transferred to the magnetizing inductance, and there is the OFF period when the transistor is quiescent and the external circuit is relaxing in preparation for the next cycle. In each of these portions of the cycle simplifications can be made which reduce the complexity of analysis of the circuit and lead to simple relationships.

Approximant for the Switching Periods

A circuit which approximates the blocking oscillator during the switching portion of the cycle is shown in Fig. 2. It is assumed at the outset that once the triggering pulse has been applied the emitter is forward-biased and the circuit behaves in an essentially linear manner. The circuit of Fig. 2 should exhibit natural frequencies corresponding to growing transients. In particular, it will be the purpose of the analysis shown later to determine this natural frequency and to permit its maximization by proper choice of the transformer turns ratio. The transistor is approximated to have negligible emitter resistance, negligible collector conductance, and a unity low-frequency alpha, or current gain. Typical values of base resistance, collector capacitance and alpha cutoff frequency for junction triodes are shown in Fig. 2. It is assumed that the bias circuit on the emitter acts substantially like an open circuit and that the diodes connected to the collector also behave like open circuits during this portion of the cycle. The assumptions just indicated seem drastic but the end use of the circuit approximant is to determine suitable values of the turns ratio. The simplification of analysis makes the results easy to apply and experimental results provide substantial checks on the analysis.

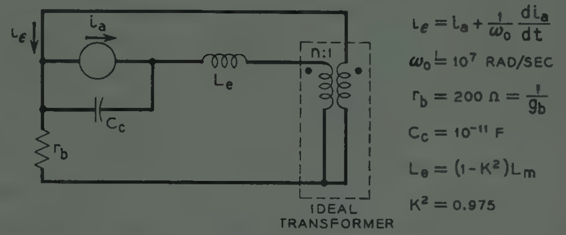

i_ϵ
i_a
L_e
C_c
r_b
n:1
IDEAL TRANSFORMER
$i_\epsilon = i_a + \frac{1}{\omega_0}\frac{di_a}{dt}$
$\omega_0 \doteq 10^7$ RAD/SEC
$r_b = 200\ \Omega = \frac{1}{g_b}$
$C_c = 10^{-11}$ F
$L_e = (1-K^2)L_m$
$K^2 = 0.975$

Fig. 2—Approximant of blocking oscillator for switching period.

Approximant for the ON Period

An approximant for the blocking oscillator during the ON period of the pulse is shown in Fig. 3. During the ON period current is transferring from the diode D_1 to the magnetizing inductance of the transformer. In the ON period the current gain of the transistor can be approximated as being constant and the effect of the leakage inductance and the collector capacitance can be neglected. The diode D_1 behaves approximately like a short circuit and diode D_2 like an open circuit.

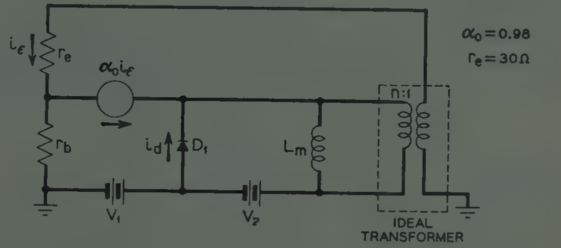


Fig. 3—Approximant for blocking oscillator during ON period.

Analysis of the Switching Part of the Cycle

As far as the performance of a blocking oscillator is concerned, one of the most significant characteristics is the rapidity with which the switching is accomplished. Blocking oscillators are interesting ordinarily because of the rectangular pulses which they can generate. It is of particular interest to determine how short the rise time can be in terms of the parameters of the transistor and to determine what values of turns ratio of the transformer should be employed to obtain fast response. These matters are most conveniently studied in terms of the approximant shown in Fig. 2.

---

[2] It is assumed for simplicity that the discharge of C requires longer than the discharge of the magnetizing inductance through D_2. This will not always be so and the relaxation time can in some cases be determined by the inductance discharge.

Once the triggering pulse has brought the transistor into its active region, the blocking oscillator responds in an essentially linear manner, exhibiting transient components in its response corresponding to the natural frequencies of the circuit. Because of the positive feedback of the blocking oscillator one finds that in this period the blocking oscillator is unstable; at least one of its natural frequencies corresponds to a growing transient. The growing transient component initiated by the trigger pulse becomes more significant in time than the other components, which decay. Thus it is clear that the switching time is related to the unstable natural frequency. The larger this natural frequency is, the more rapid the growth of the transient; hence the shorter the rise time. In addition it is apparent that the initial value of the growing transient is determined by the nature and value of the triggering pulse. The trigger pulse can be viewed as a means of establishing initial conditions in the blocking oscillator which in turn establish the transients to follow. One would like to have the trigger pulse establish a large component of the growing transient in order that a short time required for the remainder of the switching transient be completed by the oscillator on its own. In this connection it is clear that there are other triggering points than the one shown at the emitter which need to be considered. Differing trigger points provide different impedances to the trigger pulse; it is possible to trigger the blocking oscillator at some points with smaller expenditure of energy than is required at others.

The first problem of switching to consider is the determination of the natural frequencies of the blocking oscillator during the switching period, and in particular to determine how the unstable natural frequency can be maximized. To evaluate the natural frequencies of the approximant shown in Fig. 2, write the force-free nodal or loop equations and equate the system determinant to zero. This gives the characteristic equation

$$p^3 + \left[\omega_0 + \frac{(n-1)^2}{g_b L_e}\right] p^2 + \left[\frac{\omega_0 (n-1)^2}{g_b L_e} + \frac{1}{C_c L_e}\right] p - \frac{\omega_0 (n-1)}{C_c L_e} = 0. \quad (1)$$

For n greater than unity, one of the coefficients in the characteristic equation is negative and by Descartes' rule of signs the equation must have a positive real root, indicated as p_1. It turns out that this is the only root corresponding to a growing transient. An estimate of the rise time of the output pulse in terms of the positive root p_1 can be obtained from the following reasoning. Where other roots have negative real part and p_1 has a positive real part, it is clear that following the application of a trigger pulse, the transient component corresponding to p_1 increases while the others decrease. At the termination of the pulse rise, the growing transient is ordinarily the predominant component by far. A reasonable measure of rise time is the amount of time required for that component to have changed from 10 per cent to 100 per cent of its value at the end of the rise. Thus, since t must increase by $2.3/p_1$ for $\epsilon^{p_1 t}$ to increase tenfold, the rise time is approximately $2.3/p_1$.

In the design of the transformer, one ordinarily specifies the turns ratio and the magnetizing inductance. It is accordingly convenient to replace L_e in (1) by $(1-K^2)L_m$, where L_m is the magnetizing inductance and K is the coefficient of coupling, leading to

$$(1-K^2)p^3 + \left[(1-K^2)\omega_0 + \frac{(n-1)^2}{g_b L_m}\right]p^2 + \left[\frac{\omega_0 (n-1)^2}{g_b L_m} + \frac{1}{C_c L_m}\right] p - \frac{\omega_0 (n-1)}{L_m C_c} = 0. \quad (2)$$

If one has a transformer in which the coefficient of coupling is very close to unity, it is clear that the characteristic equation reduces essentially to a quadratic having for $n>1$, one positive and one negative root. Further, since all of the coefficients of p are positive, for any value of n, the positive root decreases as K decreases. Thus for fast rise times one should use as good coefficient of coupling as possible.

It is of interest to determine the relationship of the postive root of (2) to ω_0, the radian cutoff frequency of alpha. Thus we define a new variable

$$x = \frac{p}{\omega_0}, \quad (3)$$

in terms of which one rewrites (2) as follows:

$$(1-K^2)x^3 + \left[(1-K^2) + \frac{(n-1)^2}{g_b \omega_0 L_m}\right] x^2 + \left[\frac{(n-1)^2}{g_b \omega_0 L_m} + \frac{1}{\omega_0^2 C_c L_m}\right] x - \frac{(n-1)}{L_m C_c \omega_0^2} = 0. \quad (4)$$

In (4) the parameters which are subject to design control are L_m and n. The same parameters, as is shown later, are significant in specification of the pulse width. For small ferrite transformers a typical value of $(1-K^2)$ is .975; for typical grown-junction triode transistors $\omega_0 = 10^7$ rad/sec, $g_b = .005$ mhos, and $C_c = 10^{-11}$ farads. It is possible to plot in $L_m - n$ plane the loci of points which solve (4) for various values of x and the parameters typical of the transistor. This is done simply by obtaining from (4) an expression for L_m in terms of x and n:

$$L_m = \frac{-\dfrac{(n-1)^2 x^2}{g_b \omega_0} - \left[\dfrac{(n-1)^2}{g_b \omega_0} + \dfrac{1}{\omega_0^2 C_c}\right] x + \dfrac{n-1}{C_c \omega_0^2}}{(1-K^2)x^3 + (1-K^2)x^2}. \quad (5)$$

On the same plane one can show the loci of points which correspond to desired constraints as far as pulse width is concerned, as will be seen subsequently.

In Fig. 4 (opposite page) are shown loci of values of L_m and n which solve (4) for particular values of x. The figure contains, implicitly, information regarding

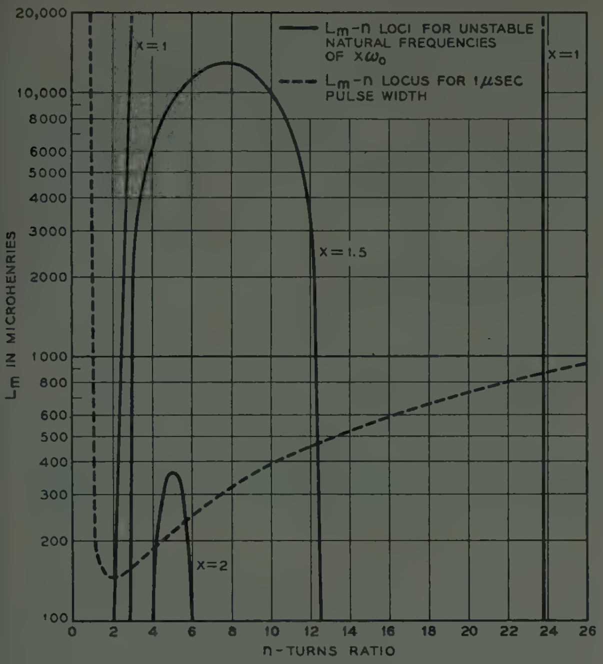


Fig. 4—Loci in L_m-n plane for constant natural frequencies and for 1 μsec pulse width.

switching speeds of blocking oscillators with transistors having the parameter values quoted above. Moreover, it makes possible the selection of the optimum turns ratio for fastest operation.

Fig. 4 reveals an interesting possibility of transistor blocking oscillators. It shows that for appropriate turns ratios growing transients with exponents twice as large as $\omega_0 t$ occur for typical junction triode blocking oscillators. This is interesting in comparison to the maximum growing transients found in Eccles-Jordan type of transistor circuits in which the maximum exponent of the growing transient is $\omega_0 t$.[3]

Clearly the limiting x for positive L_m's is obtained for $L_m=0$ and for the point on the loci of constant x in the L_m-n plane with zero slope. It is simple to find the values of n where zero slope of the loci for constant x occur from (5).

$$\frac{dL_m}{dn}=\frac{-\frac{2(n-1)x^2}{g_b\omega_0}-\frac{2(n-1)}{g_b\omega_0}x+\frac{1}{C_c\omega_0^2}}{(1-K^2)x^3+(1-K^2)x^2}=0. \quad (6)$$

Thus

$$\frac{dL_m}{dn}=0 \quad \text{where} \quad n=1+\frac{g_b}{2C_c\omega_0(x^2+x)}\cdot \quad (7)$$

For typical junction triode transistor parameters and $x=2$ one finds that n should be, by (7), about 5.3. A following section reveals that this turns ratio in combination with a suitable magnetizing inductance gives pulses with 0.1 microsecond rise times and 2 microsecond duration.

From (5) one can determine the fastest possible blocking oscillator through finding the value of x which gives $L_m=0$ when n is the optimum value. From (5), $L_m=0$ when

$$\frac{g_b(n-1)}{C_c\omega_0}-(n-1)^2(x^2+x)-\frac{g_b x}{\omega_0 C_c}=0. \quad (8)$$

By (7) one obtains, with (8),

$$\frac{g_b^2}{2C_c^2\omega_0^2(x^2+x)}-\frac{g_b^2}{4C_c^2\omega_0^2(x^2+x)}-\frac{g_b x}{C_c\omega_0}=0, \text{ or} \quad (9)$$

$$x^3+x^2=\frac{g_b}{4C_c\omega_0}\cdot \quad (10)$$

The value of x, solving (10), is designated as x_m and represents an upper limit on the normalized unstable natural frequency of the blocking oscillator. For $g_b=.005$, $C_c=10^{-11}$ and $\omega_0=10^7$, x_m is 2.03, which corresponds to a rise time of $(2.3/2.03)\times 10^{-7}$ sec.

Analysis of ON Portion of Cycle

At the termination of the switching period, the magnetizing inductance is not carrying appreciable current, Fig. 3, but it has a voltage of V_2 across it. The emitter current is easily seen to be

$$i_e=-\frac{V_2}{n[r_e+r_b(1-\alpha_0)]}\cdot \quad (11)$$

The current entering the transformer must be i_e/n. Thus diode D_1 at the outset carries a current

$$i_d=\frac{V_2}{n[r_e+r_b(1-\alpha_0)]}\left[\alpha_0-\frac{1}{n}\right]. \quad (12)$$

The pulse width T is the amount of time required for this amount of current to build up in the magnetizing inductance L_m. During the pulse, the transfer of current from the diode to the inductor occurs linearly with no effect on the remainder of the circuit.

$$T=\frac{(\alpha_0 n-1)L_m}{n^2[r_e+r_b(1-\alpha_0)]}\cdot \quad (13)$$

The locus of values of L_m and n corresponding to 1 microsecond pulse lengths is shown on Fig. 4, where values of α_0 of .98 and r_e of 30 ohms are used in (13).

On the basis of the curves shown on Fig. 4 one observes that the optimum turns ratio is about 5 and that one gets here a growing transient with an exponent of $2\omega_0 t$, leading to 0.1 microsecond rise time.

Experimental Results on Rise Time and Pulse Width

Two B.T.L. *n-p-n* grown-junction transistors with parameter values very nearly equal to typical values previously mentioned were used in circuit configuration shown in Fig. 5(a) (page 1636). Using a transformer with a 5 to 1 turns ratio and a 500 microhenry magnetizing inductance, rise times of about 0.10 and 0.11 microseconds were measured at the collector. The pulse widths measured were 2.1 and 2.4 microseconds. These results compare favorably with the predicted values of 0.1 microsecond rise time, and 2.0 microsecond pulse width. Fig. 5 shows the circuit configuration and photographs of the response. Note that this circuit is not triggered by an input pulse, but by a charging condenser. A step trigger might cause a better rise time.

---

[3] J. V. Linvill, "Nonsaturating two transistor pulse circuits," Proc. IRE, vol. 43, pp. 826–834; July, 1955.

The design equations have also been worked out using typical parameter values for *p-n-p* alloy junction transistors with frequency cutoff values of about 3 megacycles. When using appropriate transformers, rise times of 0.07 microsecond and pulse widths of 0.75 microsecond have been obtained. These results are in good agreement with predicted results.

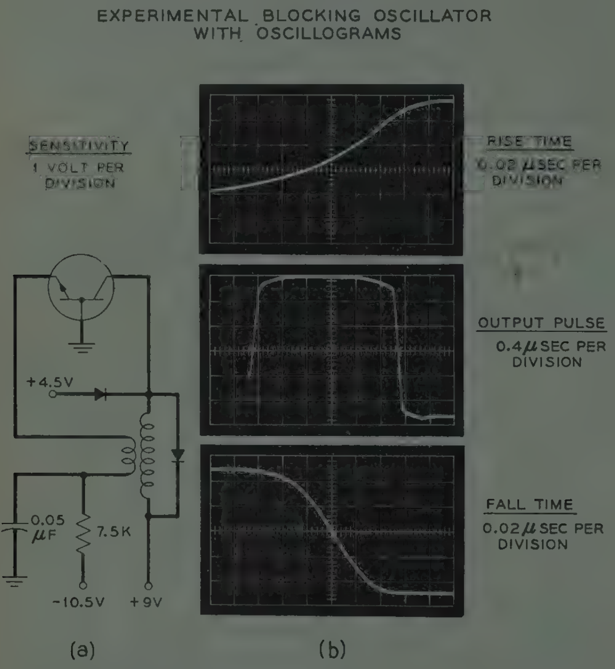


Fig. 5—Experimental blocking oscillator with oscillograms.

The Triggering Problem

In the foregoing analysis of the switching period, principal emphasis is placed on the growing transient component of response. While it is true that practically any pulse which removes the reverse bias of the emitter initiates all transient components including the unstable one, the growing component dominates after a short period of time.

It is interesting to compare results for pulses applied in different places. Different triggering points are best supplied by pulse sources of different internal impedance. Moreover, one finds that to develop a given size of the growing transient requires more energy for certain triggering points than others.

Three possible triggering points are shown in Fig. 6 along with suitable forms of triggering pulses. Each of the pulses can be assumed to take the transistor immediately into its active region. For this reason it is appropriate to use the approximant for the blocking oscillator shown in Fig. 2. Each of the triggering pulses excites all of the transient modes of the circuit but with increasing time the unstable transient greatly dominates the others. For parameters of the typical grown-junction triode and for the 5:1 turns ratio selected on the basis of the preceding sections one finds that within 50 millimicroseconds the growing transient is multiplied by 2.7 while the decaying components are multiplied by .02 and .00003. A convenient means of comparing different pulsing points is to consider responses to 50 millimicrosecond pulses. One should select for each pulsing point such an amplitude as will cause a standard magnitude of growing exponential. The amounts of energy required for three points can then be compared.

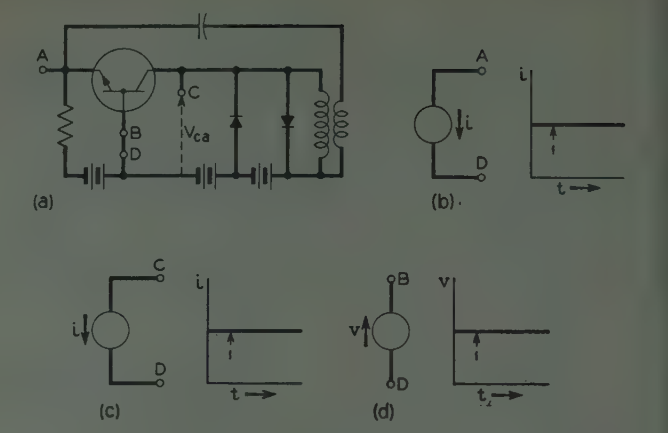


Fig. 6—Blocking oscillator and pulses with which it can be triggered. (a) Blocking oscillator with terminals for application of triggering pulses. (b) Current pulse for emitter triggering. (c) Current pulse for collector triggering. (d) Voltage pulse for base triggering.

Fig. 7 (opposite page) shows calculated responses to steps of current or voltage applied at points indicated in Fig. 6. On the basis of these response calculations one can determine what energy is required of the trigger source to bring the growing transient component of collector voltage to the value (1 volt) indicated on Fig. 7 in 50 millimicroseconds. One observes by rough graphical integration of $\int i_{\text{source}} v_{\text{source}} dt$ from Fig. 7 that for the case of emitter triggering this is about 3.5×10^{-11} joules; for the case of the collect triggering the energy is about 3.3×10^{-11} joules and for the case of base triggering the energy is about 6×10^{-11} joules. For the case of emitter triggering the ratio of source voltage to source current changes, starting at 200 ohms, dropping to 40 ohms, and rising again to 200 ohms. For the case of collector triggering, the voltage-current ratio begins at 200 ohms and rises to more than 5,000 ohms at the end of the 50 mμs period. For the case of base triggering with voltage source, the voltage-current ratio after an initial drop becomes 250 ohms throughout the 50 mμs period.

The foregoing discussion is highly idealized and naturally is expected to yield only order of magnitude answers. When trigger-pulse sources of finite impedance rather than the infinite or zero impedance sources used for Fig. 7 are employed, these influence the natural frequencies of the circuit and influence the rise times and energies in a way which is neglected in the above analysis. Second, the blocking oscillator does not become instantaneously active and linear as indicated in the analysis. Rather the transition is a gradual one as current builds up in the emitter, its incremental resistance at first being very high. Thus at first the circuit behaves differently from its subsequent behavior. The energies indicated above are significant only for comparison purposes since the analysis gives really no indication of what the minimum energy is which can be used to trigger the circuit reliably. It does indicate that the differences in energy for triggering in the various points is not widely different but the best source impedances to be used in different places is quite different.

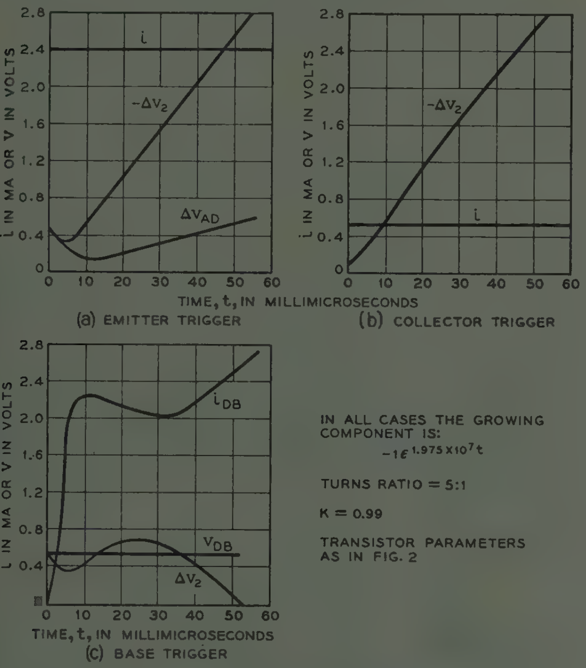


Fig. 7—Calculated responses of blocking oscillator to three triggers as in Fig. 6.

Experimental Results on Triggering

An *n-p-n* grown-junction transistor with typical parameter values was investigated in the circuit configuration shown in Fig. 8(a). Fig. 8(b) shows the calculated and measured responses to the three types of triggers. Other transistors and various trigger pulses were also investigated, and correlation between calculated and experimental results was good.

Fig. 8(b), Position 1, is a plot of the response voltage vs time when the emitter has a 5 milliampere current trigger impressed. The dotted curve is the calculated curve. The discontinuities in this curve are due to the fact that the 50 millimicrosecond trigger pulse was assumed to have zero rise and fall times. The measured response could not have such sharp discontinuities because it is a physical rather than a mathematical system. However, the shape of the curves is very similar. Note that at the end of 50 millimicroseconds the trigger is no longer feeding energy into the system. The circuit is responding by itself at a rate determined by its natural frequencies.

Fig. 8(b), Position 2, is the response vs time when an one milliampere current trigger is impressed at the collector. Note the similarity between Positions 1 and 2 in Fig. 8(b). This indicates that the main difference between the emitter and collector trigger is the 5 to 1 transformer. About the same amount of energy in each case will give the same response.

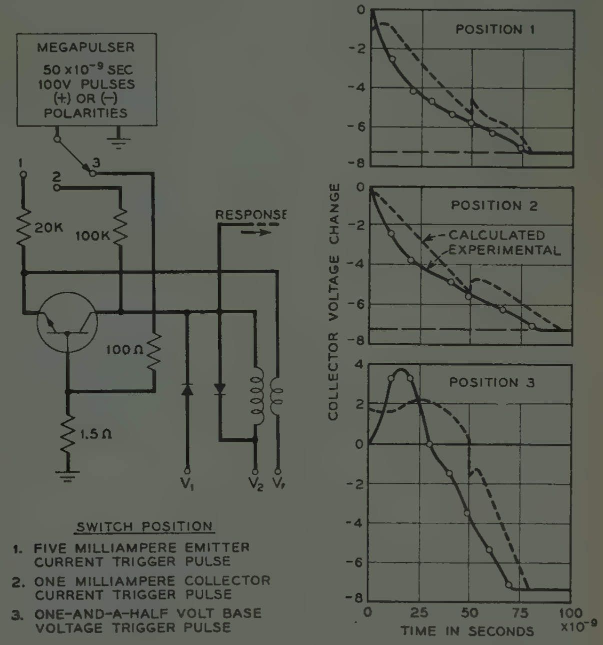


Fig. 8—Circuit and responses for triggering studies.

The calculated and experimental responses to a 1.5 volt trigger impressed at the base are shown in Fig. 8(b), Position 3. Again note the general shapes of the curves are very similar, although the sharp discontinuities are not present in the experimental curve.

In all figures the dashed curves are the calculated results and the solid curves are the experimental results. Note that all of the responses are deviations of the collector voltage from an original or quiescent voltage.

The Effect of Loading on Blocking Oscillator Performance

To this point the blocking oscillators described have been considered to work into infinite impedances. Ordinarily blocking oscillators are required to provide some useful output power. Hence it is interesting to determine how results obtained in the foregoing are altered by application of a load. The analysis of a loaded blocking oscillator is much like that of an unloaded one; many of the preceding results are altered in a simple manner. One would expect the application of a load to slow the switching time somewhat and to alter the transformer design for optimum speed. The following analysis substantiates these expectations in a quantitative way.

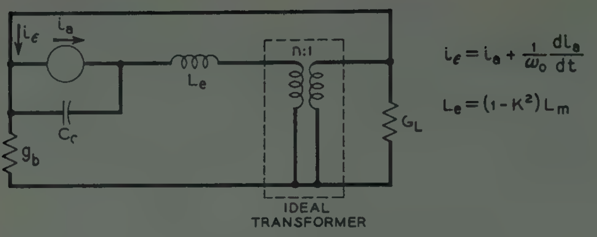


Fig. 9—Approximant for loaded blocking oscillator during switching.

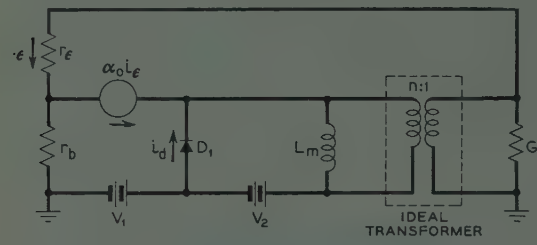


Fig. 10—Approximant for loaded blocking oscillator during ON period.

An approximant for switching to the blocking oscillator circuit with a conductive load connected to the collector is shown in Fig. 9.[4] The characteristic equation for this approximant where one uses a normalized frequency variable is [compare (4)]

$$(1-K^2)x^3+\left[(1-K^2)+\frac{(n-1)^2}{L_m\omega_0(g_b+G_L)}\right]x^2 + \left[\frac{(n-1)^2}{(g_b+G_L)L_m\omega_0}+\frac{1}{L_mC_c\omega_0{}^2}\right]x-\frac{g_b(n-1)}{L_mC_c\omega_0{}^2(g_b+G_L)}=0. \quad (14)$$

One observes that every g_b in (4) is replaced by g_b+G_L and the negative constant with which the positive root varies significantly is decreased. One can plot loci of constant x-values which solve (14) in the L_m-n plane as was done before with similar kinds of curves resulting. The analog to (5) is

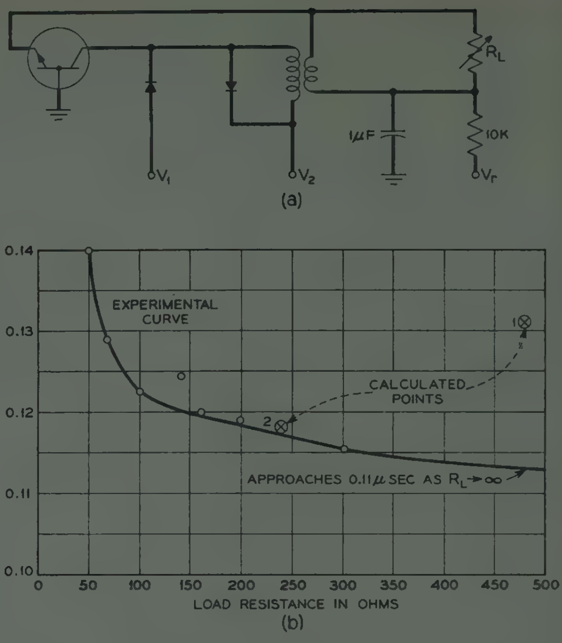


Fig. 11—Circuit and response for loading studies.

On the basis of (16) one can determine the amount of loading which will reduce the speed of the growing transient by any desired amount. By (17) one can determine approximately the appropriate turns ratio for the transformer.

Suppose one wishes to determine how much loading is permitted if x is to be 1.5 rather than the value 2 found for typical triode parameters in the unloaded case. Eq. (16) reveals that G_L, if $x=1.5$ is

$$G_L = 1.2g_b \text{ or } \frac{1}{G_L} = 166 \text{ ohms.} \quad (18)$$

For this case the turns ratio, by (17), should be approximately 6.7. One would obtain approximately the same results with a loading resistor from collector to ground of 7,500 ohms.

$$L_m = \frac{\dfrac{g_b(n-1)}{(g_b+G_L)\omega_0{}^2C_c} - \dfrac{(n-1)x^2}{\omega_0(g_b+G_L)} - \left[\dfrac{(n-1)^2}{(g_b+G_L)\omega_0}+\dfrac{1}{C_c\omega_0{}^2}\right]x}{(1-K^2)x^3+(1-K^2)x^2}. \quad (15)$$

The turns ratio corresponding to maximum x for $L_m=0$ is found by the same process as used in the unloaded case, to give in place of (10),

$$x^3+x^2 = \frac{g_b{}^2}{4C_c\omega_0(g_b+G_L)}. \quad (16)$$

The turns ratio which gives $dL_m/dn=0$ is given by (7) without change for the loaded case

$$n = 1 + \frac{g_b}{2C_c\omega_0(x^2+x)}. \quad (17)$$

The effect of a load on the pulse width of the blocking oscillator can be evaluated through considering the approximant of Fig. 10. An analysis precisely like that leading to (13) for the unloaded case leads to

$$T = L_m\left[\frac{\alpha_0 n - 1}{n^2[r_e+(1-\alpha_0)r_b]} - \frac{G_L}{n^2}\right] \quad (19)$$

for the loaded case.

Experimental Results with Loading

Fig. 11(a) shows the experimental circuit configuration for the investigation of the loading problem. Fig. 11(b) is a graph of rise time vs load resistance using a

---

[4] Alternately, a series load could be applied. A generally similar analysis to that which follows could be applied for the series case.

7 to 1, one millihenry transformer. Two calculated values of rise time can be obtained for checking purposes. The first value is for a no-load condition ($G_L=0$). By interpolation from Fig. 4, a 7 to 1, one millihenry transformer corresponds to an x of about 1.8. This corresponds to a rise time of 0.13 microsecond which gives the point labeled (1) on Fig. 11(b). The second value of rise time is for a loaded condition. Knowing the turns ratio and the transistor parameters, (17) can be solved for the value of x. This value of x substituted into (16) gives a value of G_L. The value of x can be used to solve for the rise time with this particular load. Thus, a second point can be calculated and it is labeled (2) on Fig. 11(b).

Previously it was shown that a 5 to 1 turns ratio resulted in the fastest rise time for the unloaded case. If the circuit is loaded as shown in Fig. 11(a), the rise time will become slower because the load robs some of the feedback current. However, by increasing the turns ratio the rise time may be shortened by restoring some of the feedback current. From (16) and (17) it is possible to calculate either the optimum turns ratio for a given load or the optimum load for a given turns ratio. Fig. 11(b) shows that the calculated and experimental value of optimum load for a given turns ratio are about the same.

Eq. (20) shows how the pulse width changes with the load conductance. Experimental measurements confirm this variation.

Theory of Shot Noise in Junction Diodes and Junction Transistors*

A. VAN DER ZIEL†, SENIOR MEMBER, IRE

Summary—**A theory of shot noise in junction diodes and transistors is presented, based upon a transmission line analogy. The noise is caused by the randomness in the diffusion of the minority carriers and the randomness in the recombination of minority and majority carriers. In transmission line analogy, first process corresponds to distributed noise emf's in series with transmission line, and second process corresponds to distributed noise current generators in parallel to transmission line. After magnitude of these equivalent distributed noise sources has been determined, noise problem is solved by standard methods. It is found that theoretical results for a junction diode agree with experimental work published earlier.**

An equivalent circuit describing the noise in transistors is presented. It contains two partially correlated noise current generators i_{p1} and i_{p2}, i_{p1} connected across the emitter junction and i_{p2} connected across the collector junction. $\langle i_{p1}^2\rangle_{av}$, $\langle i_{p2}^2\rangle_{av}$ and $\langle i_{p1}^*i_{p2}\rangle_{av}$ are calculated. At low frequencies emitter and collector current show full shot effect and i_{p1} and i_{p2} are almost completely correlated; at higher frequencies the correlation becomes less complete.

The noise can also be described by an emf e_s in series with the emitter and a current generator i_p in parallel to the collector junction. $\langle e_s^2\rangle_{av}$, $\langle i_p^2\rangle_{av}$ and $\langle e_s^*i_p\rangle_{av}$ are calculated. At low frequencies e_s and i_p are uncorrelated, but some correlation is expected at higher frequencies. Low-frequency results resemble earlier equivalent circuits of Montgomery, Clark, and van der Ziel, and of Giacoletto.

INTRODUCTION

IN THE past, diffusion problems have been solved occasionally with the help of a transmission line analogy. Recently Dr. D. O. North, RCA Laboratories, showed the author that the same method could be extended to noise problems in diodes and transistors.[1] This idea, for which Dr. North deserves the credit, is applied in this paper. To put the paper in a self-consistent form and to help readers that are unfamiliar with the method, we first develop the analogy, then apply it to derive known diode and transistor formulas, and finally extend it to noise problems.

The noise mechanisms discussed in this paper do not refer to the IF noise mechanism which predominates at low frequencies. For good transistors the IF noise is important below 1,000 cycles, for poorer transistors its influence extends even to higher frequencies. The noise mechanisms discussed here are thus those that predominate at higher frequencies, at which the influence of the IF noise is negligible.

I. THE TRANSMISSION LINE ANALOGY OF DIFFUSION PROBLEMS IN SEMICONDUCTORS

The differential equations for a distributed line with negligible distributed self-inductance are

$$\partial E/\partial x = -RI,$$
$$\partial I/\partial x = -GE - C\partial E/\partial t, \tag{1}$$

where E is the voltage, I the current and R, G, and C the resistance, conductance and capacitance per unit length. We shall show that the diffusion equations for current carriers in a semiconductor can be written in a form that is identical with (1).

Consider the one-dimensional diffusion of minority carriers injected into semiconducting material, such as occurs in junction diodes and in the base region of junction transistors. Let "drift" of the minority carriers be negligible in comparison with "diffusion." Further

---

* Original manuscript received by the IRE April 21, 1955; revised manuscript received, June 6, 1955, this work was supported by the U. S. Signal Corps.

† Dept. of Elec. Engrg., Univ. of Minnesota, Minneapolis, Minn.

[1] D. O. North, 1955 Conference on Semiconductor Device Research, Philadelphia, Pa.; June, 1955; and earlier discussions.

let the material be n-type, so that the minority carriers are holes. Let the material have a cross-sectional area A and a length w. If we integrate over the cross-sectional area A, we have the diffusion equations

$$\begin{aligned}\partial p/\partial t &= -(p-p_n)/\tau_p - (1/e)\partial i_p/\partial x\\ i_p &= -eD_p\partial p/\partial x,\end{aligned}\tag{2}$$

where D_p is the hole diffusion coefficient, τ_p the hole lifetime, e is the electronic charge, i_p is the hole current and p_n is the equilibrium hole concentration, whereas p is the actual hole concentration (both per unit length, of course). Introducing the excess hole concentration $p'=(p-p_n)$, we rewrite (2) as

$$\begin{aligned}\partial p'/\partial x &= -(1/eD_p)i_p\\ \partial i_p/\partial x &= -(e/\tau_p)p' - e\partial p'/\partial t,\end{aligned}\tag{2b}$$

which shows a complete analogy with (1). We thus have the following correspondences: E corresponds to the excess hole concentration p', I corresponds to the hole current i_p, R corresponds to $(1/eD_p)$ G corresponds to (e/τ_p) and C corresponds to e. To solve the problem of hole flow in n-type material, we solve the corresponding transmission line problem by standard methods and then translate back to the original problem.

Two important quantities in transmission line theory are the characteristic impedance $Z_0=R^{1/2}/(G+j\omega C)^{1/2}$ and the propagation constant $\gamma=R^{1/2}(G+j\omega C)^{1/2}$. In the diffusion problem the corresponding quantities are

$$\begin{aligned}Z_0 &= [e^2D_p(1+j\omega\tau_p)/\tau_p]^{-1/2}:\\ \gamma &= a+jb = [(1+j\omega\tau_p)/D_p\tau_p]^{1/2}.\end{aligned}\tag{2c}$$

We shall call these quantities the *characteristic impedance* and the *propagation constant* of the semiconductor. For low frequencies these quantities reduce to:

$$Z_0 = Z_{00} = [e^2D_p/\tau_p]^{-1/2} \quad \gamma = \gamma_0 = (D_p\tau_p)^{-1/2}, \tag{2d}$$

so that (2*c*) may be written

$$Z_0 = Z_{00}/(1+j\omega\tau_p)^{1/2}: \quad \gamma = \gamma_0(1+j\omega\tau_p)^{1/2}. \tag{2e}$$

II. Application to p-n Junctions

Consider a p-n junction in which the current is all carried by holes and in which the n-region is infinitely long for all practical purposes (that is, the length w of the n-region is such that practically none of the holes injected at one end reach the electrode at the other end). We put the origin of our co-ordinate system at the point at which the holes are injected into the n-region. If no voltage is applied to the junction, the concentration at $x=0$ is equal to the equilibrium concentration p_n. If a voltage V is applied to the diode, the hole concentration at $x=0$ becomes:

$$p = p_n \exp(eV/kT). \tag{3a}$$

The hole concentration follows the applied voltage almost instantaneously. If in particular a dc voltage V_0 and a small ac voltage $V_1 \exp(j\omega t)$, $(eV_1/kT \ll 1)$ are applied, we may write

$$p = p_n + p_0' + p_1' \exp(j\omega t), \tag{3b}$$

where

$$\begin{aligned}p_0' &= p_n[\exp(eV_0/kT)-1]:\\ p_1' &= p_n(eV_1/kT)\exp(eV_0/kT)\end{aligned}\tag{3c}$$

For an infinite transmission line of characteristic impedance Z_0 an applied voltage E gives rise to an input current E/Z_0. Applying this directly to our p-n junction, we have for the dc hole current at $x=0$,

$$\begin{aligned}I_p &= p_0'/Z_{00} = I_{p0}[\exp(eV_0/kT)-1]:\\ I_{p0} &= ep_n(D_p/\tau_p)^{1/2}.\end{aligned}\tag{4}$$

In the same way we have for the ac hole current at $x=0$,

$$\begin{aligned}i_p &= I_1\exp(j\omega t) = p_1'\exp(j\omega t)/Z_0\\ &= G_0(1+j\omega\tau_p)^{1/2}V_1\exp(j\omega t).\end{aligned}\tag{5}$$

Consequently, ac admittance of junction becomes

$$Y = G+jB = I_1/V_1 = G_0(1+j\omega\tau_p)^{1/2}, \tag{6a}$$

where G_0 is the dc conductance of the junction

$$\begin{aligned}G_0 &= (e/kT)e(D_p/\tau_p)^{1/2}p_n\exp(eV_0/kT)\\ &= (e/kT)(I_p+I_{p0}).\end{aligned}\tag{6b}$$

Eq. (6a) may be rewritten as

$$\begin{aligned}G &= G_0[\tfrac{1}{2}(1+\omega^2\tau_p^2)^{1/2}+\tfrac{1}{2}]^{1/2}\\ B &= G_0[\tfrac{1}{2}(1+\omega^2\tau_p^2)^{1/2}-\tfrac{1}{2}]^{1/2}.\end{aligned}\tag{6c}$$

Finally, we obtain for the dc hole concentration in the n-region,

$$p'(x) = p_0'\exp(-\gamma_0 x) = p_0'\exp[-x/(D_p\tau_p)^{1/2}]. \tag{7}$$

We have thus derived all well-known formulas of junction diode theory.

III. Application to Junction Diode Noise Problems

Let the junction be short-circuited as far as ac is concerned, then, according to (3c), the ac hole concentration at $x=0$ is zero. The fluctuating hole *current* at $x=0$ is not zero, however, and the noise current in the external short-circuit is equal to it. We thus have to calculate the mean square value of this fluctuating hole current at $x=0$.

The noise in the p-n junction is caused by two mechanisms: fluctuations in the hole concentration at all points of the n-region due to diffusion, and to recombination. Both mechanisms are independent; their effects should, therefore, be added quadratically. For that reason, both effects are discussed separately. We assume again that all current is carried by holes and the n-region is infinitely long for all practical purposes.

We first turn to the random processes of hole-electron pair creation and recombination. We split the semiconductor into sections of length Δx. According to (2b), the above process corresponds to a dc hole current ($\partial p'/\partial t=0$ for stationary current flow):

$$e(p' + p_n)\Delta x/\tau_p - ep_n\Delta x/\tau_p,$$

disappearing between x and $(x+\Delta x)$. The first term is due to hole-electron pair recombination and the second term is due to hole-electron pair creation. Since pair recombination and pair creation are independent random processes, the two currents fluctuate independently: because the individual events are independent and random, and because the chance of recombination within the interval Δx is very small, one would expect full shot effect for these currents. The mean square value of the Fourier component Δi_{px} is, therefore,

$$\begin{aligned}\langle \Delta i_{px}^2 \rangle_{av} &= 2edf[e(p' + p_n)\Delta x/\tau_p + ep_n\Delta x/\tau_p] \qquad (8)\\ &= 2e^2df(p' + 2p_n)\Delta x/\tau_p.\end{aligned}$$

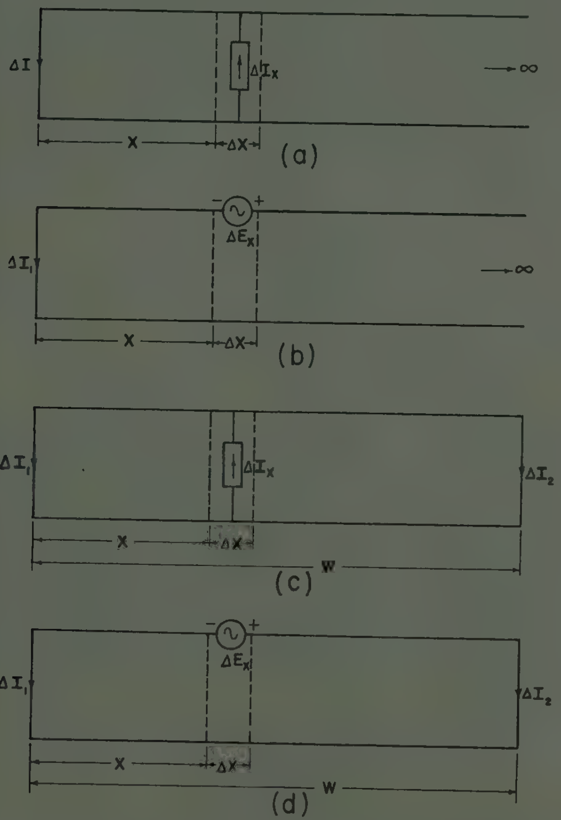


Fig. 1—Transmission line equivalent circuits of semi-conductor noise. (a) Equivalent circuit of recombination fluctuations in a junction diode. (b) Equivalent circuit of diffusion fluctuations in a junction diode. (c) Equivalent circuit of recombination fluctuations in a transistor. (d) Equivalent circuit of diffusion fluctuations in a transistor.

In our transmission line analogy, a current generator ΔI_x connected across the line at a distance x from the input gives rise to a current ΔI in the lead short-circuiting the input (Fig. 1(a)):

$$\Delta I = \Delta I_x \exp(-\gamma x).$$

Applying this to our $p-n$ junction, we find for the mean square value of the hole current in the lead short-circuiting the input, due to the hole current generator Δi_{px},

$$\begin{aligned}\langle \Delta i_p^2 \rangle_{av} &= \langle \Delta i_{px}^2 \rangle_{av} \exp(-2ax)\\ &= [2e^2df(p' + 2p_n)\Delta x/\tau_p] \exp(-2ax), \qquad (9a)\end{aligned}$$

where a is the real part of γ:

$$a = [(1 + \omega^2\tau_p^2)^{1/2} + 1]^{1/2}/(2D_p\tau_p)^{1/2} = \gamma_0(G/G_0). \qquad (9b)$$

We now turn to the effect of the random diffusion processes. We split the semi-conductor into sections of length Δx and calculate the density fluctuations δp in these sections. Making a Fourier analysis of these fluctuations, we find for the mean square value of the Fourier components Δp_x of δp:

$$\langle \Delta p_x^2 \rangle_{av} = 4(p' + p_n)\Delta x df/D_p. \qquad (10)$$

An indirect proof of this formula is given at the end of this section.

In our transmission line analogy a fluctuating emf ΔE in series with line between x and $(x+\Delta x)$ produces a current ΔI in lead short-circuiting input [Fig. 1(b)]:

$$\Delta I = (\Delta E/Z_0) \exp(-\gamma x). \qquad (11)$$

Therefore, the mean square value of the Fourier component of the fluctuating hole current in the lead short-circuiting the input of the junction is

$$\begin{aligned}\langle \Delta i_p^2 \rangle_{av} &= [(\Delta p_x^2)_{av}/|Z_0|^2] \exp(-2ax)\\ &= [4e^2df(p' + p_n)\Delta x/\tau_p](1 + \omega^2\tau_p^2)^{1/2}\\ &\quad \cdot \exp(-2ax). \qquad (12)\end{aligned}$$

We now add (9a) and (12) and integrate with respect to x. This yields for the mean square value of the Fourier component i_p of the hole current fluctuation at $x=0$ (equal to the current fluctuation in the external circuit):

$$\begin{aligned}\langle i_p^2 \rangle_{av} &\doteq (2e^2df/\tau_p)\Big[\int_0^\infty (p'+2p_n) \exp(-2ax)dx\\ &\quad + 2(1+\omega^2\tau_p^2)^{1/2} \int_0^\infty (p'+p_n) \exp(-2ax)dx\Big]\\ &= 2edf[I_p(-1+2G/G_0)+I_{p0}(2G/G_0)]\\ &= 4kTGdf - 2eI_pdf. \qquad (13a)\end{aligned}$$

The noise is thus represented by a current generator i_p in parallel to the junction. The final result in (13a) follows from substituting (7), putting

$$(1+\omega^2\tau_p^2)^{1/2} = -1+2(G/G_0)^2; \quad \gamma_0+2a = \gamma_0(1+2G/G_0);$$
$$Z_{00}/(\gamma_0\tau_p) = 1/e \qquad (13b)$$

and finally substituting (4).

Equating

$$\langle i_p^2 \rangle_{av} = 2eI_{eq}df. \qquad (14a)$$

we find for the equivalent saturated diode current I_{eq} of the junction,

$$I_{eq} = I_p(-1 + 2G_1G_0) + I_{p0}(2G/G_0). \qquad (14b)$$

For low frequencies $G \simeq G_0$, and (14b) reduces to

$$I_{eq} = (I_p + 2I_{p0}). \qquad (14c)$$

This allows a very simple interpretation; the noise is just as if two currents (I_p+I_{p0}) and $-I_{p0}$ were flowing across the p-n barrier, each showing full shot effect.[2] That this interpretation gives the correct result, however, is accidental; it does not describe the physical mechanism and it would give erroneous results at higher frequencies. Equating

$$\langle i_p^2\rangle_{av} = n\cdot(4kTGdf), \tag{15a}$$

we find, for the noise ratio of the junction,

$$n = 1-(1/2)(G_0/G)I_p/(I_p+I_{p0}). \tag{15b}$$

For low frequencies $G \simeq G_0$, and (15b) reduces to the well-known formula

$$n = n_0 = (1/2)(I_p+2I_{p0})/(I_p+I_{p0}), \tag{15c}$$

which follows immediately from combining (14c) and (6b). At very high frequencies the noise ratio rises from the low-frequency value n_0 to the limiting value $n_\infty = 1$. This agrees very well with the experimental results.[3] The calculations thus give a simple explanation of the fact that n is relatively independent of frequency and also explain the finer details of the experiments.

For $I_p=0$ we find $n=1$ at all frequencies, as would be expected from Nyquist's theorem. Note that this result is only achieved because of (10). Any other expression would have resulted in a violation of Nyquist's theorem for $I_p=0$. Our final result thus gives an indirect verification of (10) for $p'=0$. Since the random diffusion processes affect the equilibrium hole concentration p_n and the excess hole concentration p' in the same manner, p' and p_n have to occur in the formula in the same way. We therefore conclude, even without a detailed proof, that (10) must be correct. Up to now we have not yet been able to give a *direct* proof of (10).

It is sometimes convenient to know the noise resistance R_n of the junction. Since R_n is a measure for the noise emf in series with the junction, we find its value by putting

$$4kTR_n df = \langle i_p^2\rangle_{av}/|Y|^2, \tag{16a}$$

where Y is the junction admittance. This yields

$$R_n = (1/2G_0)[2(G/G_0)(I_p+I_{p0})-I_p] \cdot\{(I_p+I_{p0})[2(G/G_0)^2-1]\}^{-1}: \tag{16b}$$

for low frequencies $(G\simeq G_0)$ this reduces to the well-known formula,

$$R_n = R_{n0} = (1/2G_0)(I_p+2I_{p0})/(I_p+I_{p0}). \tag{16c}$$

We thus see that R_n decreases with increasing frequency.

IV. DC AND AC OPERATION OF TRANSISTORS

We now apply our theory to p-n-p transistors and assume again that all current is carried by holes. The difference with the junction diode case is that the n-region is now much shorter. It corresponds to a transmission line of finite length. Let w be the width of the n-region.

In our calculations we often have to apply emf's to the emitter junction and (or) to the collector junction. Since the base layer (n-layer) has a true base resistance r_b', this is not quite equivalent to applying these emf's between the emitter and base electrodes and (or) between the collector and base electrodes, respectively. For the same reason, short-circuiting the emitter and collector junction is not quite equivalent to putting short-circuiting connections between the emitter and base electrodes and between the collector and base electrodes, respectively. This is important for the equivalent circuit that is going to be developed.

If we have a transmission line of length w, with a voltage E_s at the sending end and a voltage E_R at the receiving end, then the voltage distribution along the line is

$$E(x) = E_s[\sinh\gamma(w-x)/\sinh\gamma w] + E_R(\sinh\gamma x/\sinh\gamma w), \tag{17}$$

and the input and output currents are

$$I_s = E_s/(Z_0\tanh\gamma w) - E_R/(Z_0\sinh\gamma w)$$
$$I_R = E_s/(Z_0\sinh\gamma w) - E_R/(Z_0\tanh\gamma w). \tag{18}$$

We can apply this directly to the n-region of our p-n-p transistor. Let V_e be the dc signal applied across the emitter junction and V_c the dc signal applied across the collector junction. If p_n is the equilibrium hole concentration in the n-region, then the excess hole concentration $p_{e0'}$ at the emitter junction $(x=0)$ and the excess hole concentration p_{c0}' at the collector junction $(x=w)$ are given by the equations

$$p_{e0}' = p_n[\exp(eV_e/kT)-1];$$
$$p_{c0}' = p_n[\exp(eV_c/kT)-1]. \tag{19}$$

$p_{c0}'\simeq -p_n$ if the collector is properly biased.

If small ac signals

$$v_e = V_{e1}\exp(j\omega t) \quad\text{and}\quad v_c = V_{c1}\exp(j\omega t)$$

are applied across the emitter and the collector junction, respectively, the ac hole densities at the emitter junction $(x=0)$ and at the collector junction $(x=w)$ are

$$p_{e1}'\exp(j\omega t) = (e/kT)V_{e1}\exp(j\omega t)\cdot p_n\exp(eV_e/kT),$$
$$p_{c1}'\exp(j\omega t) = (e/kT)V_{c1}\exp(j\omega t)\cdot p_n\exp(eV_c/kT),$$

because the hole densities at $x=0$ and at $x=\mathrm{w}$ readjust themselves almost instantaneously to the applied voltages. $p_{c1}'\simeq 0$ if the collector is properly biased. This is usually the case and we shall assume that it is true here.

---

[2] The result obtained at low frequencies is, therefore, identical with what would be expected from the emission theory (compare: A. van der Ziel, "Noise," Prentice-Hall, New York, 1954: p. 216). An earlier treatment appears in V. F. Weisskopf, "On the Theory of Noise in Conductors, Semi-conductors, and Crystal Rectifiers," NDRC 14-33, May 15, 1943.

[3] R. L. Anderson and A. van der Ziel, "On the shot effect of p-n junctions," TRANS. IRE, vol. EO-1, pp. 20–24; November, 1952.

We thus have for the dc excess hole density distribution in the n-region, according to (17),

$$p'(x) = p_{e0}'[\sinh \gamma_0(w - x)/\sinh \gamma_0 w] + p_{c0}'(\sinh \gamma_0 x/\sinh \gamma_0 w); \tag{20}$$

whereas the dc hole currents at $x=0$ and $x=w$ are

$$I_e = p_{e0}'/(Z_{00} \tanh \gamma_0 w) - p_{c0}'/(Z_{00} \sinh \gamma_0 w).$$
$$I_c = p_{e0}'/(Z_{00} \sinh \gamma_0 w) - p_{c0}'/(Z_{00} \tanh \gamma_0 w). \tag{21a}$$

If $V_c=0$, then $p_{c0}'=0$ and, consequently,

$$I_e=I_{ee}[\exp (eV_e/kT)-1]; \; I_{ee}=p_n/(Z_{00} \tanh \gamma_0 w). \tag{21b}$$

If $V_e=0$, then $p_{e0}'=0$ and, consequently,

$$I_c=-I_{cc}[\exp (eV_c/kT)-1]; \; I_{cc}=p_n/(Z_{00} \tanh \gamma_0 w). \tag{21c}$$

In that case $I_c \simeq I_{cc}$ if the collector is properly biased. $I_{cc}=I_{ee}$ if p_n is uniform in the n-region; we tacitly assumed this to be the case. The base current I_b is, if $p_{c0}' \simeq -p_n$,

$$I_b = (I_e - I_c) = (1 - \alpha_0)[I_e - I_{cc}(1 + \alpha_0)]; \tag{21d}$$

where

$$\alpha_0 = 1/(\cosh \gamma_0 w) \tag{21e}$$

is a quantity that is close to unity if the width w of the n-region is small. Hence,

$$I_e = I_{cc}(1 + \alpha_0) \tag{21f}$$

for the case of zero base current (floating base). This does not seem to agree with experiments which seems to require a much larger emitter current for floating base. Leakage currents are partly responsible for this discrepancy.[4]

We now apply small ac voltages across the two junctions and neglect effects due to the change in width w of the junction; we shall take that into account later. We also assume that the collector is biased such that p_{c1}' is negligible. We then have at the emitter side

$$i_e=p_{e1}' \exp (j\omega t)/(Z_0 \tanh \gamma w)=V_{e1} \exp (j\omega t)Y_e, \tag{22}$$

and at the collector side,

$$i_c = p_{e1}' \exp (j\omega t)/(Z_0 \sinh \gamma w) = \alpha V_{e1} \exp (j\omega t)Y_e = \alpha i_e; \tag{23a}$$

where

$$\alpha = 1/(\cosh \gamma w) = 1/\cosh[\gamma_0 w(1 + j\omega\tau_p)^{1/2}]. \tag{23b}$$

α is the current amplification factor: its value α_0 for low frequencies was already introduced by (21e). The emitter junction admittance Y_e is

$$Y_e = (p_{e1}/V_{e1})/(Z_0 \tanh \gamma w) = (e/kT)p_n \exp (eV_e/kT)/(Z_0 \tanh \gamma w). \tag{24a}$$

For low frequencies this expression reduces to

$$Y_e = g_{e0} = (e/kT)p_n \exp (eV_e/kT)/(Z_{00} \tanh \gamma_0 w) = (e/kT)[I_e + (1 - \alpha_0)I_{cc})], \tag{24b}$$

so that the expression for high frequencies may be written

$$Y_e=g_{e0}(1+j\omega\tau_p)^{1/2} \tanh \gamma_0 w/\tanh [\gamma_0 w(1+j\omega\tau_p)^{1/2}]. \tag{24c}$$

We have thus verified the well-known transistor formulas by this method. We note that our problem reduces to the junction diode problem mentioned previously if $w \rightarrow \infty$, this corresponds to $\alpha_0 \rightarrow 0$.

We now turn to the effects caused by the change in width of the n-region due to the ac voltages V_e and V_c applied across the emitter and the collector junction, respectively. These effects occur because the width of the transition region of a p-n junction depends upon the voltage applied across the junction. Usually the effects of the fluctuating boundary at the emitter side can be neglected but the effects of the fluctuating boundary at the collector side have to be taken into account. This has three effects:[5]

1. It modulates the true resistance r_b' of the base region; described by an emf $\mu_{bc}V_c$ in series with r_b'.
2. It modulates the current amplification factor α, this gives rise to a collector junction admittance Y_c'.
3. It modulates the current flow across the emitter junction; this can be described by a fluctuating emf $\mu_{ec}V_c$ in series with Y_e.

In addition true capacitance C_c of collector junction is in parallel to Y_c'. Equivalent circuit is shown in Fig. 2. At high frequencies μ_{ec} and Y_c' may be complex.

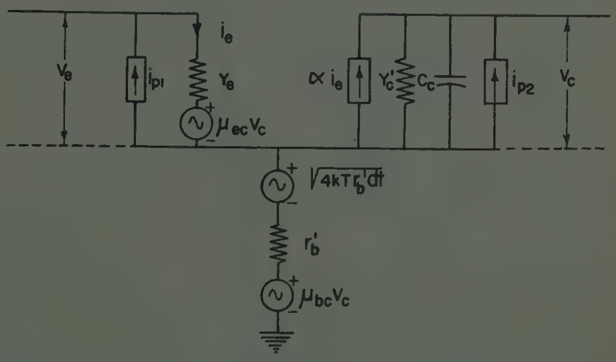


Fig. 2—Equivalent circuit of noise in junction transistors. The noise is described by two partially correlated current generators i_{p1} and i_{p2}, the feedback properties by two emf's $\mu_{ec}v_c$ and $\mu_{bc}v_c$.

V. APPLICATION TO NOISE PROBLEMS IN TRANSISTORS

We now want to calculate the noise currents flowing across the emitter and collector junctions when both junctions are short-circuited. Our diffusion problem thus corresponds to a transmission line with input and output short-circuited.

---

[4] L. J. Giacoletto, private communication.

[5] J. M. Early, "Effects of space-charge layer widening in junction transistors," PROC. IRE, vol. 40, pp. 1401–1406; November, 1952.
L. J. Giacoletto, "Study of p-n-p alloy junction transistor from dc through medium frequencies," *RCA Rev.*, vol. 15, pp. 506–562; December, 1954.

We divide the n-region of the transistor into small sections of length Δx. The noise due to hole-electron pair creation and recombination in the region between x and $(x+\Delta x)$ may then again be represented by a parallel current generator Δi_{px} and the noise due to random diffusion processes may be represented by a fluctuating hole density Δp_x between x and $(x+\Delta x)$. According to Section III,

$$\langle \Delta i_{px}^2 \rangle_{av} = 2e^2 df(p' + 2p_n)\Delta x/\tau_p;$$
$$\langle \Delta p_x^2 \rangle_{av} = 4(p' + p_n) df \Delta x/D_p. \qquad (25)$$

We now apply the same reasoning as in Section III; the only difference is that we now have an equivalent transmission line of finite length w, short-circuited at both ends, and that we have to know the short-circuit currents at both the input and the output.

In our transmission line case, a parallel-connected current generator ΔI_x between x and $(x+\Delta x)$ produces currents ΔI_1 and ΔI_2 in input and output [Fig. 1(c)]:

$$\Delta I_1 = \Delta I_x \sinh \gamma(w - x)/\sinh \gamma w;$$
$$\Delta I_2 = \Delta I_x \sinh \gamma x/\sinh \gamma w|; \qquad (26)$$

and an emf ΔE_x connected between x and $(x+\Delta x)$ produces currents $\Delta I_1'$ and $\Delta I_2'$ in input and output [Fig. 1(d)]:

$$\Delta I_1' = -(\Delta E_x/Z_0)\cosh \gamma(w - x)/\sinh \gamma w;$$
$$\Delta I_2' = +(\Delta E_x/Z_0)\cosh \gamma x/\sinh \gamma w. \qquad (27)$$

We thus have for our diffusion problem,

$$\Delta i_{p1} = \Delta i_{px} \sinh \gamma(w - x)/\sinh \gamma w$$
$$- (\Delta p_x/Z_0)\cosh \gamma(w - x)/\sinh \gamma w$$
$$\Delta i_{p2} = \Delta i_{px} \sinh \gamma x/\sinh \gamma w$$
$$+ (\Delta p_x/Z_0)\cosh \gamma x/\sinh \gamma w. \qquad (28)$$

Since Δi_{px} and Δ_{px} are uncorrelated, Δi_{p1} and Δi_{p2} will be only *partially* correlated.

We find, therefore, that the noise of the transistors can be represented by two partially correlated current generators i_{p1} and i_{p2} across the emitter and collector junctions, respectively. These quantities are obtained by summing the effects of the individual sections Δx. Since fluctuations in different intervals are independent and since Δi_{px} and Δp_x are independent also, the fluctuations have to be added quadratically. Replacing the summation by an integration, we obtain

$$\langle i_{p1}^2 \rangle_{av} = \sum \langle \Delta i_{p1}^2 \rangle_{av}$$
$$= \int_0^w \langle \Delta i_{px}^2 \rangle_{av} |\sinh \gamma(w-x)/\sinh \gamma w|^2$$
$$+ \int_0^w \langle \Delta p_x^2 \rangle_{av} |\cos \gamma(w-x)/\sinh \gamma w|^2/Z_0|^2 \qquad (29)$$

$$\langle i_{p2}^2 \rangle_{av} = \sum \langle \Delta i_{p2}^2 \rangle_{av}$$
$$= \int_0^w \langle \Delta i_{px}^2 \rangle_{av} |\sinh \gamma x/\sinh \gamma w|^2$$
$$+ \int_0^w \langle \Delta p_x^2 \rangle_{av} |\cosh \gamma x/\sinh \gamma w|^2/|Z_0|^2 \qquad (30)$$

$$\langle i_{p1}^* i_{x2} \rangle_{av} = \sum \langle \Delta i_{p1}^* \Delta i_{p2} \rangle_{av}$$
$$= \int_0^w \langle \Delta i_{px}^2 \rangle_{av} [\sinh \gamma^*(w-x) \sinh \gamma x/|\sinh^2 \gamma w|]$$
$$- \int_0^w \langle \Delta p_x^2 \rangle_{av} [\cosh \gamma^*(w-x)$$
$$\cdot \cosh \gamma x/|\sinh^2 \gamma w|]/|Z_0|^2. \qquad (31)$$

The problem of noise in transistors is hereby solved in principle for all frequencies. For small w the term with $\langle \Delta p_x^2 \rangle_{av}$ predominates; that is, diffusion is the most important effect. In that case, the correlation coefficient for i_1 and i_2 is almost equal to -1, except at the highest frequencies (See Section VI).

The quantities i_{p1} and i_{p2} represent the effect of shot noise in transistors. Besides these two current generators, one has to introduce the thermal noise emf $(4kTr_b'df)^{1/2}$ of the true base resistance r_b'. The full equivalent circuit, as far as noise is concerned, is, therefore, as given in Fig. 2.

VI. Further Discussion of Transistor Noise

For relatively low frequencies we may put $\gamma = \gamma_0$ and $Z_0 = Z_{00}$, this simplifies the integrations in (29)–(31). Introducing (25) for $\langle \Delta i_{px}^2 \rangle_{av}$ and $\langle \Delta p_x^2 \rangle_{av}$, substituting (20) for $p'(x)$, carrying out the integrations in (29)–(31), substituting the expressions for I_e, I_c and I_{cc} and bearing in mind that $p'_{c0} \simeq -p_n$ in practice, we obtain:

$$\langle i_{p1}^2 \rangle_{av} = 2e[I_e + 2I_{cc}(1 - \alpha_0)]df \qquad (32)$$
$$\langle i_{p2}^2 \rangle_{av} = 2eI_c df \qquad (33)$$
$$\langle i_{p1}^* i_{p2} \rangle_{av} = -2e[I_c - I_{cc}(1 - \alpha_0)]df. \qquad (34)$$

The emitter and collector current thus show full shot effect; the correlation coefficient c of the emitter current and the collector current fluctuations is

$$c = \langle i_{p1}^* i_{p2} \rangle_{av}/[\langle i_{p1}^2 \rangle_{av} \cdot \langle i_{p2}^2 \rangle_{av}]^{1/2}$$
$$\simeq -(I_c/I_e)^{1/2} \simeq -\alpha_0^{1/2}; \qquad (34a)$$

the latter part of the equation holds if we neglect a few small terms of the order $I_{cc}(1-\alpha_0)$. The correlation coefficient is thus closely equal to -1 at low frequencies.

Except perhaps for very small currents, the terms containing the quantity I_{cc} may be neglected at low frequencies. We would have obtained that approximation also, if we had neglected the terms p_{c0}' and p_n in $\langle \Delta i_{px}^2 \rangle_{av}$ and $\langle \Delta p_x^2 \rangle_{av}$. This should still be a reasonable approximation at very high frequencies, even though it may not be as accurate as at low frequencies. By substituting

$$p'(x) = p_{e0}' \sinh \gamma_0(w - x)/\sinh \gamma_0 w; \qquad \gamma = a + jb;$$
$$a = \gamma_0[\tfrac{1}{2} + \tfrac{1}{2}(1 + \omega^2\tau_p^2)^{1/2}]^{1/2};$$
$$b = \gamma_0[-\tfrac{1}{2} + \tfrac{1}{2}(1 + \omega^2\tau_p^2)^{1/2}]^{1/2} \tag{35}$$

into (29)–(31) and carrying out the integrations, we obtain

$$\langle i_{p1}^2\rangle_{av} = 2eI_e df[-1 + \tanh \gamma_0 w\,(a \sinh 2aw + b \sin 2bw)/(\gamma_0 |\sinh^2 \gamma w|)] \tag{36}$$
$$\langle i_{p2}^2\rangle_{av} = 2eI_c df \tag{37}$$
$$\langle i_{p1}^* i_{p2}\rangle_{av} = -2eI_c df[\gamma \sinh \gamma_0 w/(\gamma_0 \sinh \gamma w)]. \tag{38}$$

Introducing the emitter junction admittance $Y_e = g_e + jb_e$ [(24)], and bearing in mind that $I_c = \alpha_0 I_e$ and that $Y_e = g_{e0} = eI_e/kT$ at low frequencies, these equations may be written:

$$\langle i_{p1}^2\rangle_{av} = 2eI_e df(-1 + 2g_e/g_{e0})$$
$$= 2kTdf \cdot (2g_e - g_{e0}) \tag{36a}$$
$$\langle i_{p2}^2\rangle_{av} = 2eI_c df = 2kTdf \cdot \alpha_0 g_{e0} \tag{37a}$$
$$\langle i_{p1}^* i_{p2}\rangle_{av} = -2kTdf \cdot \alpha Y_e \tag{38a}$$

Eq. (36a) is equivalent to (13a) of the junction diode.

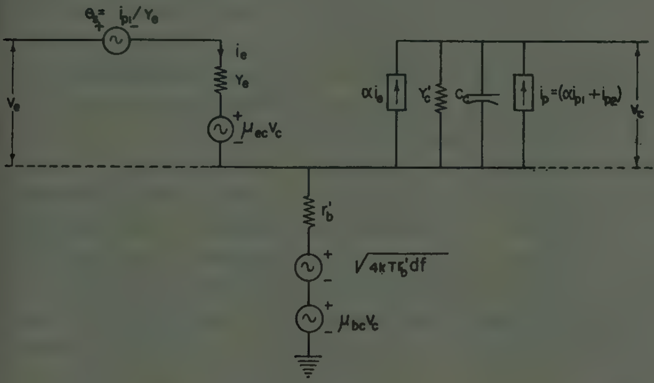


Fig. 3—Other form of equivalent circuit. The noise is now described by an emf $e_s = i_{p1}/Y_e$ in series with the input and a current generator $i_p = (i_{p2} + \alpha i_{p1})$ in parallel to the collector junction. This circuit is completely equivalent to the one shown in Fig. 2.

Our next step is to modify the equivalent circuit of Fig. 2. We observe that it is formally equivalent to circuit shown in Fig. 3 (above), where noise is represented by a noise emf $e_s = i_{p1}/Y_e$ in series with the input and a noise current generator $i_p = (i_{p2} + \alpha i_{p1})$ in parallel to the collector admittance. Applying (32)–(34) and neglecting a few small terms of the order $I_{co}(1 - \alpha_0)$, we obtain at low frequencies:

$$\langle e_s^2\rangle_{av} = \langle (i_{p1}/Y_e)^2\rangle_{av} = 2kTr_{e0}df \tag{39}$$
$$\langle i_p^2\rangle_{av} = \langle (i_{p2} + \alpha_0 i_{p1})^2\rangle_{av} = 2e\alpha_0(1 - \alpha_0)I_e df \tag{40}$$
$$\langle e_s^* i_p\rangle_{av} = \langle i_{p1}^*(i_{p2} + \alpha_0 i_{p1})\rangle_{av} r_{e0} = 0, \tag{41}$$

where r_{e0} is the emitter junction resistance at low frequencies. Hence e_s and i_p are practically uncorrelated. Except for the term due to the shot effect of the collector saturated current I_{c0}, the equivalent circuit of Fig. 3 shows resemblance with a phenomenological equivalent circuit published earlier.[6]

At higher frequencies this is no longer the case; e_s and i_p have a complex correlation coefficient $c \neq 0$ and their mean square values differ from the corresponding low-frequency values. Applying (36)–(38), we obtain:

$$\langle e_s^2\rangle_{av} = \langle i_{p1}^2\rangle_{av}/|Y_e|^2 = 2kTdf \cdot (2g_e - g_{e0})/(g_e^2 + b_e^2) \tag{42}$$
$$\langle i_p^2\rangle_{av} = 2eI_c(1 - |\alpha|^2/\alpha_0)df$$
$$= 2kTdf \cdot \alpha_0 g_{e0}(1 - |\alpha|^2/\alpha_0) \tag{43}$$
$$\langle e_s^* i_p\rangle_{av} = 2kTdf \cdot \alpha(1 - g_{e0}/Y_e^*). \tag{44}$$

At low frequencies (42) reduces to (39), (43) reduces to (40), and (44) reduces to (41).

In the phenomenological equivalent circuit the emf e_s was ascribed to "shot noise" and the current generator i_p was ascribed to "partition noise"; the latter meant that the noise is caused by fluctuations in the recombination processes. To show that at low frequencies the recombination fluctuations predominate over diffusion fluctuations in i_p, we apply (28) and write

$$i_p = \sum(\Delta i_{p2} + \alpha\Delta i_{p1})$$
$$= \alpha \sum(\Delta i_{px} \cosh \gamma x + \Delta p_x \sinh \gamma x/Z_0),$$

where the summation extends over all sections Δx of the base region. Consequently,

$$\langle i_p^2\rangle_{av} = |\alpha^2| \left[\int_0^w \langle \Delta i_{px}^2\rangle_{av} |\cosh^2 \gamma x| + \int_0^w \langle (\Delta p_x/Z_0)^2\rangle_{av} |\sinh^2 \gamma x| \right]. \tag{45}$$

The first term in this equation is due to recombination fluctuations and the second is due to diffusion fluctuations. For good junction transistors α_0 is close to unity and $|\cosh^2 \gamma x| \gg |\sinh^2 \gamma x|$ at low frequencies; therefore the recombination fluctuations predominate in i_p at low frequencies. In the same way it may be shown that diffusion fluctuations predominate in e_s at low frequencies.

The present calculation does not verify the existence of a noise term due to the shot effect of the collector saturated current. Further experimental and theoretical work is needed to clarify that situation.

The equivalent circuit also contains two feedback emf's $\mu_{ec}v_c$ and $\mu_{bc}v_c$. A calculation shows that these emf's, which are important for the amplification properties of the transistor, hardly alter the noise figure; they may therefore be omitted as far as noise considerations are concerned. This indicates that the "base resistance r_b" in the earlier phenomenological equivalent circuit actually should be the "true" base resistance r_b' of the new equivalent circuit. The numerical value for r_b that was used by Montgomery and Clark in their calculation of the noise figure actually represented the true base resistance of their transistor.[7]

---

[6] H. C. Montgomery and M. A. Clark, "Shot noise in junction transistors," *Jour. Appl. Phys.*, vol. 24, pp. 1397–1398; November, 1953.
A. van der Ziel, "Note on shot and partition noise in junction transistors," *Jour. Appl. Phys.*, vol. 25, pp. 815–816; June, 1954.

It is also possible to change the equivalent circuit of Fig. 2 by replacing the emf $\mu_{ec}v_c$ by a current generator $Y_{ec}v_c$, where $Y_{ec}=\mu_{ec}Y_e$, the current generator αi_e by a current generator $Y_{ce}v_e$, where $Y_{ce}=\alpha Y_e$, and the admittance Y_c' by an admittance:

$$Y_c'' = Y_c' + \alpha\mu_{ec}Y_e \tag{46}$$

(Y_c' is the collector junction admittance for open emitter junction and Y_c'' the collector junction admittance for short-circuited emitter junction). The circuit thus obtained closely resembles a phenomenological circuit proposed by Giacoletto.[8]

VII. Noise Figure

Let a signal source of internal impedance $Z_s=(r_s+jX_s)$ be connected to the input and let the thermal noise of the signal source be represented by an emf $(4kTr_sdf)^{1/2}$ in series with Z_s. Let the output terminals be open and let $\langle v_{ct}^2\rangle_{av}$ and $\langle v_{cs}^2\rangle_{av}$ represent the mean square value of the noise voltage across the collector junction due to transistor noise and the thermal noise of the signal source, respectively. Since $(Y_c'+j\omega C_c)$ is a small admittance, we may in first approximation assume that the noise voltages developed in the base resistance are small in comparison with the noise voltage across $(Y_c'+j\omega C_c)$. The noise figure F may then be defined as:

$$F = 1 + \langle v_{ct}^2\rangle_{av}/\langle v_{cs}^2\rangle_{av} \tag{47}$$

Calculating v_{ct} and v_{cs}, introducing the emitter junction impedance $Z_e=1/Y_e=(r_e+jX_e)$ and putting $Z_{tot}=(Z_e+Z_s+r_b')$, we obtain:

$$\begin{aligned}F = 1 + r_b'/r_s + \langle((- e_s + i_pZ_{tot}/\alpha]\\ \cdot(- e_s^* + i_p^*Z_{tot}^*/\alpha^*)\rangle_{av}/(4kTr_sdf).\end{aligned} \tag{48}$$

This does not contain any reference to the feedback emf's, indicating that feedback does not affect the noise figure in this approximation.

It may be shown that F is a minimum if:

$$X_s + X_e = - X_e/(- 1 + \alpha_0/|\alpha|^2) \tag{49}$$

$$\begin{aligned}r_s = \{[(- 1 + \alpha_0/|\alpha|^2)(r_e + r_b') + r_e]^2\\ - (\alpha_0/|\alpha|^2)(r_e^2 + X_e^2)\}^{1/2}/(- 1 + \alpha_0/|\alpha|^2)^{1/2}\end{aligned} \tag{50}$$

in which case:

$$\begin{aligned}F = F_{\min} = [(- 1 + \alpha_0/|\alpha|^2)(r_e + r_b') + r_e]/r_{e0}\\ + \{[(- 1 + \alpha_0/|\alpha|^2)(r_e + r_b') + r_e]^2/r_{e0}^2\\ - (\alpha_0/|\alpha|^2)(r_e^2 + X_e)^2/r_{e0}^2\}^{1/2}\end{aligned} \tag{51}$$

For low frequencies $\alpha=\alpha_0$, $r_e=r_{e0}$ and $X_e=0$, so that:

$$\begin{aligned}F_{\min} = \{[1 + (1 - \alpha_0)r_b'/r_{e0}]\\ + \sqrt{[1 + (1 - \alpha_0)r_b'/r_{e0}]^2 - \alpha_0}\}/\alpha_0\end{aligned} \tag{52}$$

The minimum noise figure at low frequencies is thus mainly determined by the quantity $(1-\alpha_0)r_b'/r_{e0}$; for low noise figure this quantity should be small. At higher frequencies the noise figure increases because the current amplification factor α goes to zero and $\langle i_p^2\rangle_{av}$ increases from the low-frequency value $2eI_c(1-\alpha_0)df$ to the high-frequency value $2eI_cdf$.

Conclusion

The above developments show that the transmission line analogy can be successfully applied to the solution of noise problems in junction diodes and transistors. It is interesting to note that at low frequencies the new theory shows resemblance with older phenomenological equivalent circuits. Besides, the theory also gives the hf noise behavior of the devices, a result that could not be obtained by the old method. The earlier experimental results on noise in junction diodes find hereby an adequate theoretical explanation.

The theory is a *one-dimensional* theory and the recombination is assumed to be volume recombination. Actually most recombination occurs at the surface and the problem is multi-dimensional. Deviations between theory and experiment might thus be expected in some cases. A research program is under way at the University of Minnesota to check this theory with experiment.

Acknowledgment

The author is indebted to Dr. D. O. North, RCA Labs., Princeton, N. J., for suggesting the method and for helpful criticism during the preparation of the paper; to Prof. R. E. Burgess, University of British Columbia, Vancouver, B. C., Canada, for discussions on the problem; to Dr. M. J. O. Strutt, Swiss Federal Institute of Technology, Zürich, Switzerland, for suggesting the equivalence of the equivalent circuits of Figs. 2 and 3 and for sending a pre-publication copy of a paper by W. Guggenbühl and M. J. O. Strutt on noise in transistors; and to Dr. L. G. Giacoletto, RCA Labs., Princeton, N. J., for important improvements in the manuscript.

* * *

---

[7] H. C. Montgomery, private communication.

[8] L. J. Giacoletto, Semiconductor Devices Conference. Minneapolis, Minn., June, 1954.

Multiple Frequency Shift Teletype Systems[*]

D. B. JORDAN[†], ASSOCIATE, IRE, H. GREENBERG[‡], ASSOCIATE, IRE,
E. E. ELDREDGE[§], SENIOR MEMBER, IRE AND W. SERNIUK[||], SENIOR MEMBER, IRE

Summary—**Radio teletype transmission is of such a nature that once the signal goes far enough into noise, reliable reception rapidly deteriorates. This paper calls attention to a system for radio teletype communication that has advantages that have been demonstrated both theoretically and experimentally. A new system for teletype communication is described that involves the use of several frequencies instead of the two, called "mark and space," used in convention frequency shift keying (FSK) operation. By so doing, longer pulses are allowed for equivalent transmission rates, and as a result smaller detection bandwidths are possible. The main advantage is a greater correlation between received signal plus noise and the transmitted signal. Probability of error from information theory is used to find the theoretical gain of two multiple frequency shift (MFS) systems over the conventional FSK system. Coding, filters, and special circuitry are described. An experimental comparison of one MFS system and conventional FSK operation is presented on the basis of error counts using both white and impulse noise superimposed on the signal. Theoretical gains are checked by the laboratory experimental work.**

INTRODUCTION

IN FREQUENCY shift telegraphy the carrier frequency is shifted rather than interrupted for the transmission of intelligence, that is, the "mark" and "space" signals are transmitted by two radio frequencies differing by an audio frequency. Frequency shift keying is, therefore, analogous to frequency modulation of a carrier with square waves.

A basic advantage of the frequency shift method over on-off keying of a continuous wave carrier is that the former is capable of handling large and rapid changes in signal amplitude with less distortion than the latter method, particularly in the case of long-distance radio telegraphy in the high frequency range. Also, the fact that there is a signal being received at all times permits the frequency shift method to make more effective use of agc circuits than is possible with on-off keying.

Estimates of the gain of frequency shift over "on-off" keying range from 6 to 10 decibels. This paper describes a system which gives further improvement in signal-to-noise ratio and for which improved performance under multipath conditions is to be expected. An added feature of the system is a carrier pulse which simplifies automatic frequency control and permits synchronous operation. This paper includes a discussion of both the theoretical development and experimental verification of system performance.

THEORETICAL DEVELOPMENT

Commercial frequency shift keying (FSK) radio teletype operators have found in the past that, during high noise conditions, reception is considerably improved by a reduction in rate of transmission. Alternatively the operator repeats the message in the hope that by so doing it may be understood in its entirety. Both these schemes, slower transmission and redundancy, are undesirable when traffic is heavy. By slowing down transmission speed, the operator actually increases the pulse time. This method would thus be advantageous if a reduction in keying speed could be accomplished without the corresponding undesirable and costly reduction in traffic. Such is possible through the use of a multiple frequency shift (MFS) system in which the carrier frequency is shifted to one of several alternate values for a longer time rather than to only one of two frequencies for a short period, as in FSK. Standard transmitters and existing teletypewriter equipment are adaptable to these systems through the use of a coder and decoder, and the change is kept entirely within the transmitter-receiver section of the communication system (Fig. 1). The experimental work on one such system is described below.

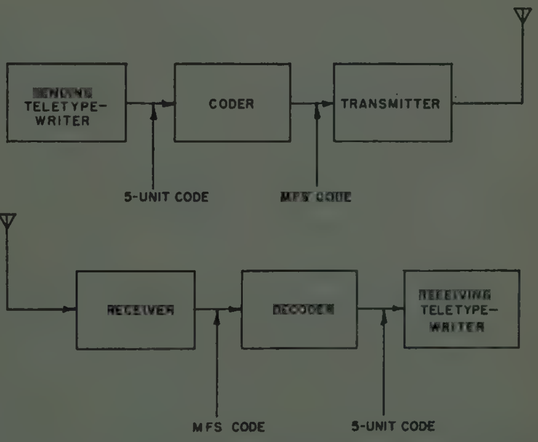


Fig. 1—Block diagram of communication system employing MFS.

Of course new coding schemes will be necessary when MFS systems are employed. To calculate the coding necessary, use will be made of the logarithmic measure of information:

$$H = \log_2 N,$$

where $\log_2$ indicates taking the logarithm to the base 2,

---

[*] Original manuscript received by the IRE, February 18, 1955; revised manuscript received, June 6, 1955.

[†] Republic Aviation Corp., Guided Missile Div., Hicksville, N. Y.

[‡] Ramo-Wooldridge Corp., Los Angeles, Calif.

[§] Electronic Defense Laboratory, Sylvania Electric Products, Inc., Mountain View, Calif.

[||] Physics Lab., Sylvania Electric Products, Inc., Bayside, N. Y.

N is the number of possible messages, and H is the amount of information, in bits, of each message.[1]

Standard teletype communication uses 32 information symbols or "messages," (26 for letters plus six extra symbols for carriage shift, line feed, etc.) which means that each contains five bits of information, since $\log_2 32 = 5$. The symbols of each system must, therefore, each contain not less than this amount. From the expressions

binary FSK (2 channel) : $5 \log_2 2 = 5$

quadruple MFS (4 channel) : $3 \log_2 4 = 6$
sextuple MFS (6 channel) : $2 \log_2 6 = 5.17$
single-pulse MFS (32 channel): $1 \log_2 32 = 5$,

it can be seen that the conventional binary FSK system satisfies this requirement by using 5 information pulses per symbol. MFS systems using 4, 6 and 32 alternate frequency positions or "channels" would thus need three, two, or one information pulses per symbol respectively. Also note that the quadruple (4-channel) system is wasteful of information when used with standard teletype equipment, and for this reason it will not be further discussed here.

It was stated that MFS systems employ pulses which are longer in time than those used by the conventional FSK system. MFS systems gain their advantage from the fact that a pulse of twice the length requires one-half the bandwidth for the same resolution, and since random noise power varies as the bandwidth, the signal-to-noise power ratio is doubled. In so doing, the rate of transmission of information is not reduced. As a standard of comparison, consider the conventional FSK system running at 60 words per minute. This corresponds to a keying speed of 42 bauds or a transmission rate of 163 milliseconds per letter. In the following discussion this figure of 163 milliseconds per letter will be used as the standard of comparison. For binary transmission this figure is divided into a 22 millisecond "start pulse," five information pulses, each 22 milliseconds long, and a "stop pulse" of 31 milliseconds. Since the start pulse only serves the purpose of releasing a clutch mechanism in the receiving teletypewriter, it will be unnecessary in MFS transmission, as this action can be supplied by the decoder. However, the stop pulse will be held for synchronization purposes and the operation of automatic frequency control. Since this stop pulse will have its own frequency channel, its length, and thus its bandwidth, can be prescribed separately in the over-all system design. If it is matched with the transmission pulse in the sextuple MFS system, then it will add only one-sixth to the *total* systems bandwidth. This is a separate consideration to transmission-channel bandwidth.

Fig. 2 indicates those frequencies to which the carrier frequency is shifted for the purpose of sending information in three systems. The binary system does not use the carrier frequency but rests on the mark frequency whereas the MFS systems will use the carrier frequency as a "stop" signal for time synchronization and automatic frequency control.

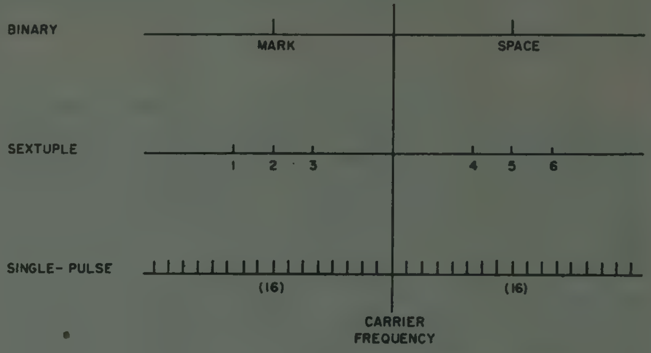


Fig. 2—Frequency band division for three systems.

The transmission of a message using the sextuple system at a similar word-per-minute rate as the binary system is shown diagramatically in Fig. 3.

It is seen that for the same information transmission rate the keying speed has been considerably cut down in MFS transmission. The pulses of the sextuple system are 66 milliseconds long and those of the single-pulse system would be 132 milliseconds long. These increases in time indicate a reduction in bandwidth per channel of three and six times, resulting in a like increase in the signal-to-noise power ratio. As for bandwidth economy, the single-pulse 32-shift system is costly since this system requires a total bandwidth of almost three times the total bandwidth required by the binary system, whereas the sextuple system requires approximately the same bandwidth as the binary system, as is shown later.

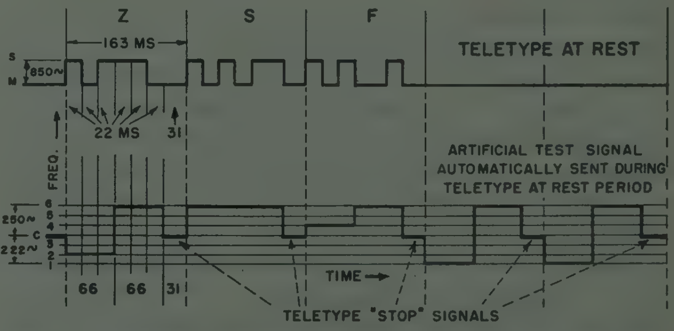


Fig. 3—Comparison of sextuple code and teletype code. Note that the "stop" signals occur at the assigned carrier frequency which is the center of the transmitting band. It is used for carrier frequency control (AFC) as well as decoder motor synchronization. Time period based on 60wpm teletype operation.

Considerable gains have been achieved in the laboratory through a narrowing of the FSK "mark" and "space" bandwidths presently used; however, in the theoretical analysis, bandwidths will be normalized to those used by the binary system for comparison purposes.

---

[1] For convenience in the comparison calculations, it is assumed here that the messages are all equally probable.

Application of Probability Theory

To show the theoretical gains realizable for MFS systems, it is possible to analyze the probability of transmission error under standard noise conditions. The resultant envelope is detected when noise or noise plus signal is passed through a narrow band-pass filter. Thus, after demodulation, a level of voltage amplitude will be received in each channel for either the binary or multiple systems. A signal voltage V received in a given channel will be registered as a correct signal if xV volts or greater is received, where x is some multiplier of V. Thus we have set a "bias level" such that everything received above xV volts is considered a signal while everything received below xV volts is not. In envelope detection, the bias level is represented by a circle of radius xV. An error will occur if no signal is sent in a channel, i.e., no signal with the proper frequency for the given channel, and through the addition of noise, a voltage of greater than xV volts is received. Error may also occur in signal channel if there is subtractive effect due to noise, and resultant voltage reads below bias level.

The transition probabilities of error for a single letter, assuming white noise having a Gaussian voltage distribution, will be derived for the binary and multiple shift systems. The envelope of the noise will then have a bivariate normal distribution.

The probability of error for the signal channel is given by the probability the vector sum of noise and signal is less than xV. This probability is given by

$$P_V = \frac{1}{V_n{}^2} \int_0^{xV} ve^{-(v^2+V^2/2V_n{}^2} I_0 \left(\frac{vV}{V_n{}^2}\right) dv,$$

where V_n is the root mean square noise voltage and I_0 is a modified Bessel function of the first kind. The probability of registering a signal in a channel in which no signal is sent will be given by

$$P_0 = \frac{1}{V_n{}^2} \int_{xV}^{\infty} ve^{-v^2/2V_n{}^2} dv = e^{-(x^2/2).(S/N)}$$

where $S/N = (V/V_n)^2$ is the signal-to-noise power ratio.

It is now necessary to consider the error in a symbol for comparison between the frequency shift systems. Consider any arbitrary system of m channels using n pulses per symbol. The probability that a signal is received in the desired channel is $(1-P_V)$, and the probability that a signal, through the addition of noise, is not received in the other channels is $(1-P_0)^{m-1}$. Thus, the probability that all n pulses are received correctly is given by $(1-P_V)^n(1-P_0)^{n(m-1)}$ where the joint probabilities are the products of the simple probabilities.

Probability of error in a symbol for any system is

$$P_m = 1 - (1 - P_V)^n(1 - P_0)^{n(m-1)}.$$

The conventional FSK system uses five pulses per symbol and two channels; thus

$$P_2 = 1 - (1 - P_V)^5(1 - P_0)^5.$$

The sextuple system uses two pulses per symbol; thus

$$P_6 = 1 - (1 - P_V)^2(1 - P_0)^{10}.$$

The 32-channel system with one pulse per symbol gives

$$P_{32} = 1 - (1 - P_V)(1 - P_0)^{31}.$$

These expressions depend on signal-to-noise ratio, and on bias level xV. It may be expected that there exist optimum values of x such that probability of error is minima for each signal-to-noise ratio value.

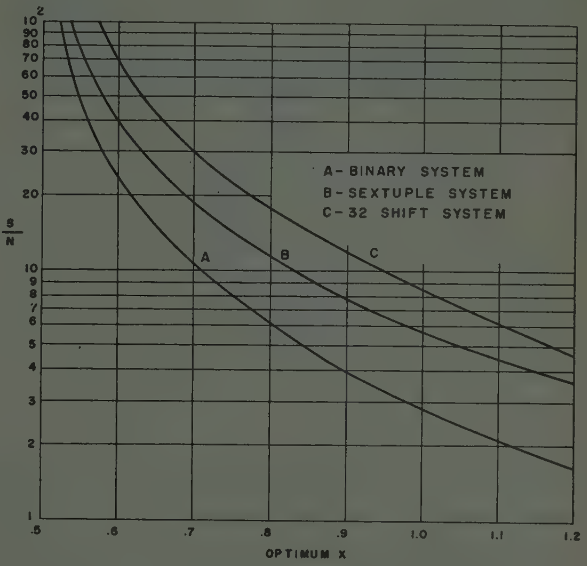


Fig. 4—Optimum bias level for various S/N ratios.

Fig. 4 gives the optimum value of x, determined through graphical means, for each system. Fig. 5 (next page) shows the probability of error, in the binary, 6- and 32-channel systems respectively, plotted for optimum bias levels. Note that these curves are plotted using the probability of error equations for pre-detection signal-to-noise. The true probabilities of error must then be found for post-detection signal-to-noise. This means that for $S/N = 8$ in the binary system the probability of error is 80 per cent; the probability of error in the sextuple system in also 80 per cent with $S/N = 2$.

More important is the fact that for the same noise conditions the probability of error is reduced in the multiple shift systems through the improvement in the S/N ratio. For example, $S/N = 8$ produces a probability of error of 80 per cent in the binary system. The ratio $S/N = 8$ in the binary system is equivalent to $S/N = 24$ in the sextuple system and produces a probability of error of only 10 per cent. Then, under the same noise conditions, a signal-to-noise improvement is obtained which reduces the probability of error from 80 per cent to 10 per cent. Similarly, the 32-channel system operates at a signal-to-noise ratio of one-sixth of that at which binary system operates for same probability of error.

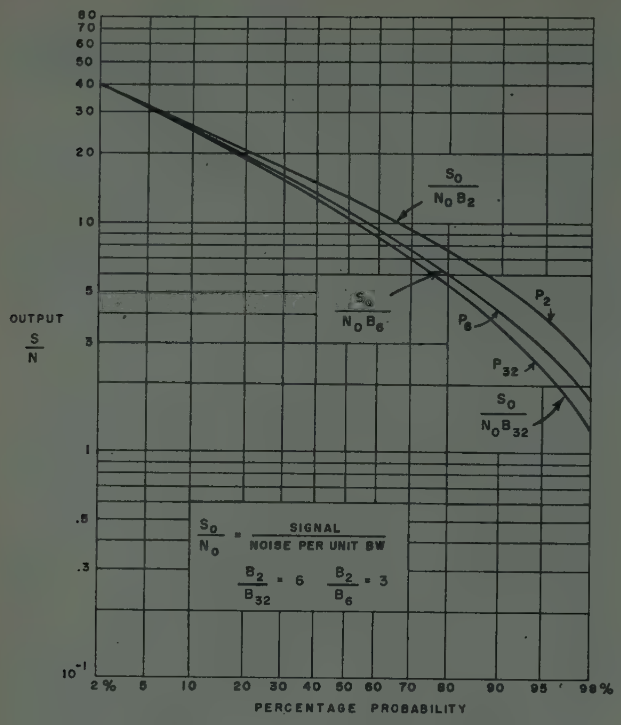


Fig. 5—Probability of error in 2-, 6- and 32-shift systems.

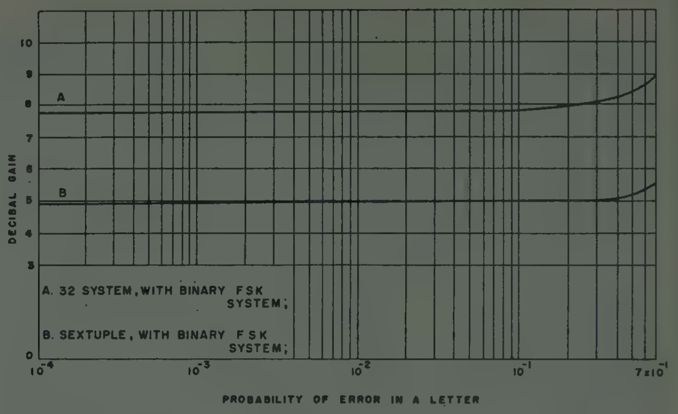


Fig. 6—Comparison of systems.

An indication of the improvement through MFS is obtained from the decibel power gain calculation, as shown in Fig. 6. The sextuple system shows about 5 decibels gain over the binary system, while the 32 system shows 7–8 decibels gain over the binary system.

The words given in Table I (below) indicate improvement in reliability of reception of signals sent by two MFS systems discussed here over those sent by the conventional FSK system. These words were taken from Di-

TABLE I

Improvement in Reliability of Reception of Signals Sent by MFS Systems Over Those Sent by FSK System

Letter	FSK	Sextuple	32-Shift
DEDUCE	xExxxx	DEDUCE	DEDxCE
WORKSHOP	WxxxxxOx	WxRKSHOP	WORKSHOP
EACH	EAxx	EAxH	EACH
FAREWELL	xxxxWExx	FARxWxLL	FAREWELL
OF	xx	Ox	OF
FROM	FRxx	xxOM	FROM
WALK	xxxx	WALx	WALK
SIMPLE	SxxPxx	SxMxLx	SIMPLE
ROOST	RxxSx	ROOx	ROOST
VALUES	xxxxxx	VxLxES	VALUES
DEBT	xxBx	DEBT	DxxT
DECISIVE	xxxxxIxx	DxCISIVx	DESICIVE
SHEIK	xxxxx	SHxIx	SHEIK
HOSE	xOxE	HxSE	HOSE
AMALGAMATED	AMxxGAxxxxx	xMALxAMxTEx	AMALxAMATED
WEAVE	WxxxE	WxAVE	WEAVE
PROCEDURE	xxxxxxUxx	PROCEDUxE	PRxCEDURE
FACT	xxCx	xxxx	FxCT
FORTHWITH	xOxxxxIxH	FORTxxxTH	FORTHWITH
APPROXIMATELY	APxxxxxMxxxxx	APPROXIMATELY	APPROXIMATExY
SHRUG	SxRUx	SHRUG	SHRUG
THE	xxx	THE	THE
FRESH	xxxSx	xRESH	FRESH
FIFE	xxxx	xIFE	FIFE
RIDGE	xxxGE	RIDxE	RIDGE
PRICE	xxxCE	PRICE	PRICE
CLAWS	xxAxx	CLxWS	CLAWS
GRAPE	Gxxxx	GRAPE	GRAPE
SACK	xxxx	SxCx	SACK
THEME	TxxMx	THExE	THEME
CHOSE	CxOSE	CHOxE	CHOSE
DUKE	Dxxx	DUKE	DUKE
SPLASH	xPxxxH	SxLASx	SPLxSH
Corresponding probability of error	$P_2 = .75$	$P_6 = .21$	$P_{32} = .03$

Toro's paper[2] presented at the 1952 Airborne Electronics Conference, and they were chosen because wrong letters can only be guessed at from the context of the word rather than from that of the sentence. In this Table, errors (indicated by X's) have been simulated using random number tables[3] with the corresponding probability of error shown thereon.

Experimental Verification

Because the sextuple MFS system theoretically offers a gain of almost five decibels in signal-to-noise over FSK without an increase in over-all bandwidth and without necessitating the large number of filters needed for the 32-frequency system, it was decided to concentrate on the sextuple system for the initial laboratory verification of the theoretical benefits of MFS. Although the sextuple system actually employs seven frequencies, it was so named because the six shift frequencies are used for code information while the carrier is used for synchronization only. To simplify the comparison of the sextuple system with the standard FSK system as many components as possible were made common to both systems.

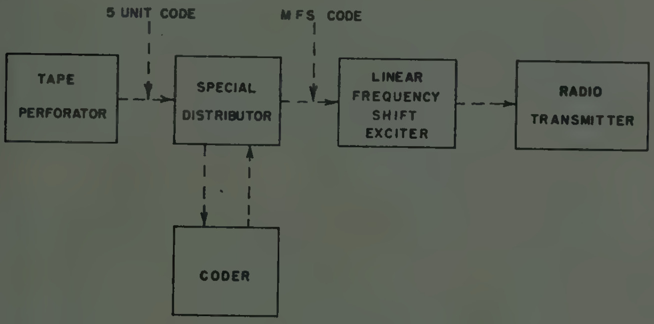


Fig. 7—Multiple frequency shift teletype transmitting system.

Fig. 7 is a block diagram of the MFS teletype transmitting system. A standard teletype distributor was modified for use with the MFS system. Information to be transmitted is fed into the transmitter-distributor on punched teletype tape. Five contacts are mechanically controlled in accordance with the pattern of holes on the tape. The movements of these five contacts control the operation of five encoder relays. The standard seven segment teletype commutator has been replaced by a unit consisting of a stop segment and two code unit segments. This gives a total time period of 163 milliseconds divided into a 31 millisecond carrier or stop pulse and two 66 millisecond information pulses. Operation of the encoder relays determines which of six fixed voltages is applied to each code unit segment. When the segment voltages are applied to the frequency shift keyer through the rotor of the transmitter distributor, a shift in frequency results. The voltages are adjusted so that three frequencies are set on each side of the "stop" or carrier center frequency. As the brushes move back to the "stop" segment, a cam operated by the motor shaft causes a microswitch to open, breaking the encoder relay energizing circuit. The microswitch closes again as soon as the brushes move past the rest position so that the encoder relays can be re-energized to set up the next character.

The linear frequency shift exciter is a standard exciter keyed by the output of the special distributor. The output of the exciter is used to drive the radio transmitter, which normally has a class-C amplifier in the output stage. Fig. 8 is a block diagram of the MFS teletype receiving system. The receiver may be a conventional communications type of receiver using a beat frequency oscillator to produce an audio output, usually in the range between 2,000 and 3,000 cycles. The receiver should have automatic volume control and a degree of selectivity depending upon the particular bandwidth requirement of the system. Normally communication receivers use a bandwidth of from 3,000 to 4,000 cycles in the intermediate frequency section. The band-pass filter that is used following the receiver is sufficiently wide to encompass the frequencies that are used in the system. In the case of the sextuple system, a frequency band from 1,700 to 2,300 cycles is satisfactory for this purpose. The limiter is of the normal type, limiting both the positive and negative peaks, and is usually set for 40 to 50 decibels of limiting. The detector for the MFS system uses a number of selective filters. In the sextuple system, 7 filters are used, one of which is the carrier filter. The selectivity curves of these filters are shown in Fig. 9 (next page). Following the filters, the signal is amplified and then is rectified by means of half-wave rectifiers.

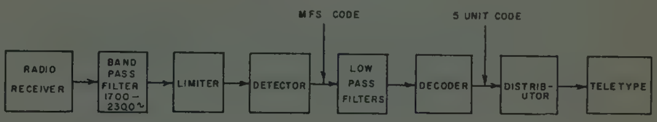


Fig. 8—Multiple frequency shift teletype receiving system.

During the course of experimental development, filter shaping and effect on signal-to-noise ratios in both the standard FSK and MFS systems were checked in some detail. The total pre-detection bandwidth of the sextuple system with a spacing of 80 cycles between center frequencies of adjacent channels is about 535 cycles per second at the three decibel points. The pre-detection bandwidth must be wide enough to encompass the range of the seven channel filters. The 80-cycle spacing of channel filters is a compromise based on criteria of pulse definition, signal-to-noise ratio, drift, filter design,

---

[2] M. J. DiToro, "Distant Radio Communication Theory," IRE Conference on Airborne Electronics, 1952 Abstract of Papers, pp. 37–47, Dayton, Ohio.

[3] See, for example, W. J. Dixon and F. T. Massey, "Introduction to Statistical Analysis," McGraw-Hill Book Co., Inc., New York, N.Y., p. 290; 1951.

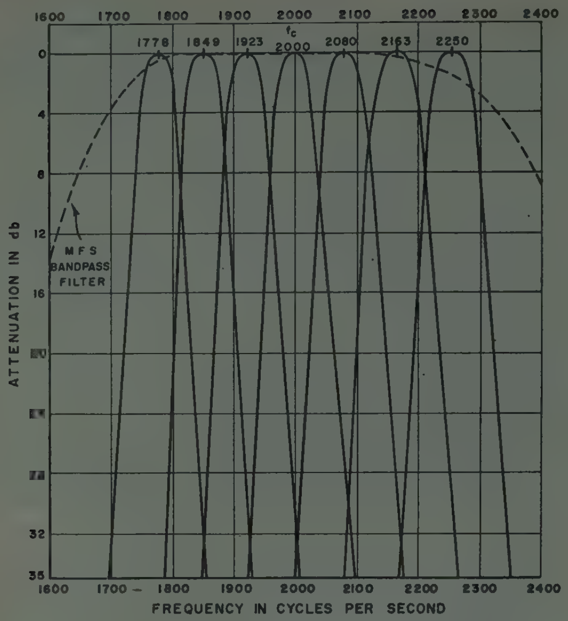


Fig. 9—Measured channel filter selectivity.

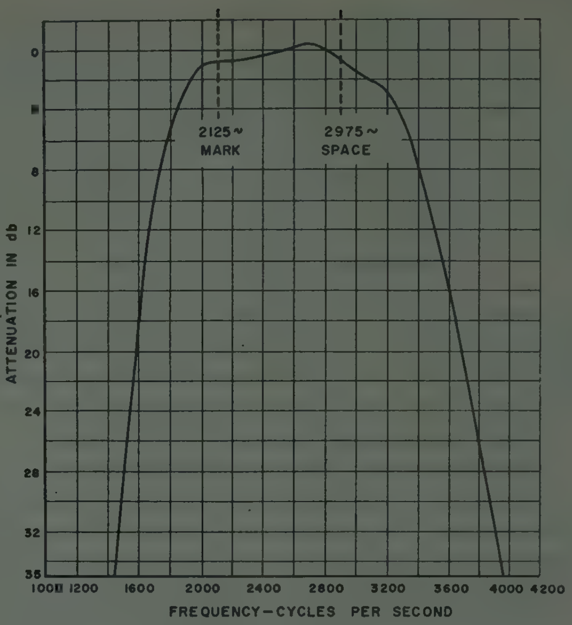


Fig. 10—Band-pass filter for standard laboratory frequency shift tests.

and deviation ratio. Deviation ratio is defined by

$$\text{Deviation Ratio} \doteq \frac{\text{Frequency Shift}}{2 \times \text{Keying Speed}}.$$

Davey and Matte[4] have shown that satisfactory separation of mark and space signals in the FSK system is possible for a deviation ratio as low as 4.7. For a 70 cycle shift the deviation ratio is 4.7 and, of course, increases for greater frequency shifts, so that the 80 cycle shift being used is acceptable from this standpoint.

In one of his texts,[5] Goldman calculates that the optimum bandwidth for the reception of a single pulse from a signal-to-noise and pulse definition standpoint is approximately three quarters of the reciprocal of the pulse time. In the sextuple system this means a channel filter bandwidth of approximately 12 cycles for a 66-millisecond pulse duration. In practice, some bandwidth allowance must be made for drift in the transmitters and receiver. In the final analysis the precise spacing of the filters was determined by the availability of filters which met the above criteria. Since the keying speed has been reduced by a factor of three, the post-detection bandwidth has been reduced by the same factor with a resultant improvement in signal-to-noise ratio.

TEST EQUIPMENT

Previous investigations of FSK systems have shown that significant improvement in reception in the presence of noise results from the use of a band-pass filter between the receiver and the limiter. In order to test the effect of filter bandwidth on performance, a filter switching unit was constructed. By means of this circuitry either the MFS bandpass filter, a standard FSK filter, a simple comb filter for FSK, or a resistance pad could be switched into the circuit between the receiver output and the limiter input.

The standard FSK band-pass filter is of the type commonly used in commercial systems. The filter frequency response is shown in Fig. 10. The simple comb filter was used in order to test the effect of further pre-detection narrowbanding in the FSK system. This filter was laboratory constructed and its frequency response is given in Fig. 11 (opposite). Resistance pad was used in place of a filter when making measurements of receiver power output, in order to have the receiver working into the same output load regardless of the system being tested.

The effect of the band-pass filter on system performance is shown in Fig. 12 (opposite). Note that the comb filter gives an improvement in signal-to-noise ratio of approximately 2 decibels over the standard filter which is, in turn, approximately $2\frac{3}{4}$ decibels better than operation with the resistance pad. These results lead to the conclusion that an FSK system should use the narrowest possible input filter consistent with keying speeds. A frequency shift of 850 cycles per second is wasteful of band space, particularly at the relatively low keying speed of 60 words per minute.[4] The tests indicate that the best input filter for an 850-cycle shift would have a frequency response similar to that shown for the comb filter used in these tests. The curves of Fig. 12 show the usual sharp breaking characteristic of a frequency shift system using a limiter. The error rate goes from zero to an unusable rate of 10 per cent or more with a 3-decibel decrease in signal-to-noise ratio.

---

[4] J. R. Davey and A. N. Matte, "Frequency-shift telegraph radio and wire applications," *Trans. AIEE*, vol. 66, pp. 479–493; 1947.

[5] S. Goldman, "Frequency Analysis Modulation and Noise," McGraw-Hill Book Co., Inc., New York, N.Y., p. 99; 1948.

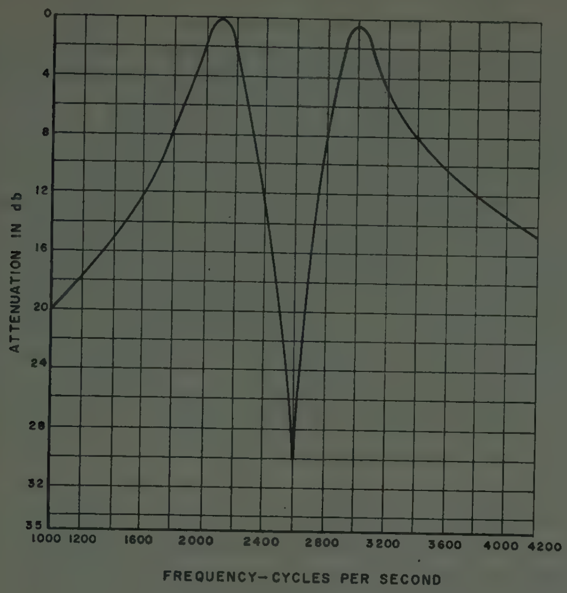


Fig. 11—Comb type filter for standard laboratory frequency shift tests.

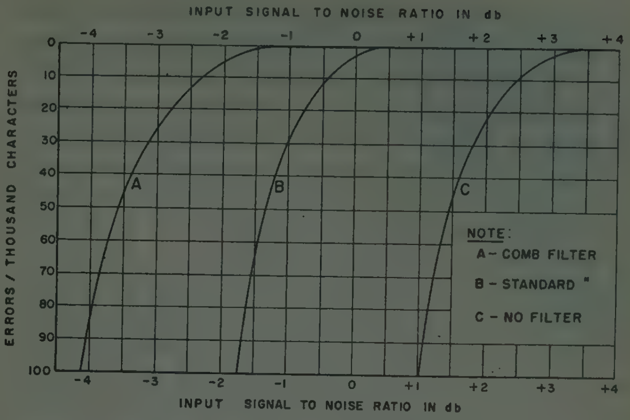


Fig. 12—Effect of band-pass filter on FSK system performance in presence of random noise (40-cycle low-pass filter).

Modern frequency shift systems generally use low pass filters after the detector, with upper cutoff in the region of 75 cycles. For laboratory test purposes a low pass filter was constructed which could be adjusted for operation with cutoff at either 40 cycles or 80 cycles. Although the 40-cycle low pass filter was found to improve the signal-to-noise ratio, it also introduced telegraph bias into the system so that the maximum noise improvement could not be obtained. Best operation should result from using an 80-cycle filter under normal operating conditions to avoid telegraph bias distortion, but switching to a 40-cycle filter under high noise conditions.

Referring again to Fig. 8, it will be noted that the MFS code is still being used through the low pass filter. The decoder is used to transform the MFS code to the normal five unit teletype code. The decoder has a bank of thyratrons whose output is in the five unit teletype code. This output feeds the distributor which runs at the normal speed of a teletype distributor. The teletype is driven by the distributor and receives 22-millisecond information pulses as well as the 22-millisecond "start" pulse and the 31-millisecond "stop" pulse. The "start" for the distributor is obtained from the decoder. The teletype now is no longer a decision instrument and the distributor is a form of regenerative repeater. No bias distortion is possible in the teletype in this system.

The carrier channel is used to maintain synchronization between the receiver and transmitter. The carrier channel rectifier is so connected that when a carrier signal is present a negative voltage is applied to the grid of a carrier relay driver, causing the carrier relay to be de-energized and breaking the relay contacts. When the received signal shifts off the carrier frequency, the grid of the relay driver becomes less negative and the carrier relay is energized. One contact of the carrier relay controls the operation of the receiver-distributor motor start circuit that maintains the receiving equipment in synchronism with the transmitter. A second contact of the carrier relay is used to clear the letter set-up in the thyratron bank.

Because of the narrow pass band of the channel filters the MFS system is comparatively intolerant of frequency drift. An automatic frequency control system has to be included which will keep the receiver locked on the carrier frequency. By maintaining the proper carrier frequency output from the receiver, all other channel frequencies will also be maintained at their proper values, provided the proper shifts are maintained in the frequency shift exciter.

A synchronizing pulse is necessary to maintain the receiver in synchronism with the transmitter. A television horizontal synchronization circuit can be modified to give improved automatic keying rate control. By the application of such a correlation technique it should be possible to reduce the length of the synchronization pulse and increase the length of the code unit pulses to further improve the ability of the system to operate in the presence of noise and multipath conditions.

The encoder and decoder used in this system have been described as using relays and thyratrons of the receiving type. Designs for an encoder and a decoder which will allow the sextuple system to transmit and receive all thirty-two teletype characters have been developed.

The initial decoder design required multiple contact relays with fast operate and release times. Acceptable relays were not readily available so that a satisfactory decoder could not be constructed. Published data on the multicontact wire relays developed by the Bell Telephone Laboratories indicated that they would be ideal for this application, but these relays were not readily available. A unit was therefore designed using thyratrons as electronic relays. More advanced techniques such as crystal diode matrices would undoubtedly lead to further simplification of the code translation circuitry.

Although the usual frequency shift teletype system operates in the high-frequency bands between 2 and 24 megacycles, the basic system can be tested for performance in noise with a much lower frequency which is more convenient for laboratory use. Consequently, a test set-up using 200 kilocycles as a carrier frequency was used. The transmitting end of this laboratory set-up consisted of the units shown in Fig. 7, with the exception of the radio transmitter. The frequency shift exciter, with an output of two to three watts, was used for this purpose, with the exciter being adjusted for operation at 200 kilocylces. In order to test perfromance when subjected to noise, two sources of noise were used; one a white noise generator and one an impulse noise generator utilizing a 60-cycle spark coil. The noise measurements were made using a thermal millimeter and all signal-to-noise ratios were measured on a root-mean-square basis. Separate gain control pads for the signal generator and the noise generators allowed various combinations of signal and noise to be used.

The receiving system comprised the units shown in Fig. 8 with the radio receiver being a simple 200-kilocycle converter having two tuned circuits in the input. The band-pass of the receiver was 3,800 cycles which approximates the usual pass band in a conventional communications receiver.

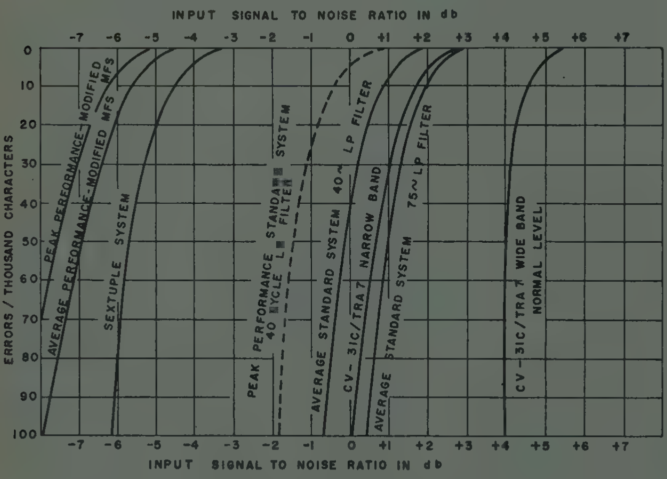


Fig. 13—Frequency shift performance in white noise.

EXPERIMENTAL RESULTS

Fig. 13 above shows performance of system in white noise compared to operation of a normal frequency shift system using the five-unit teletype code. Study of the experimental results obtained with various test tapes on the FSK system showed that, at any given signal-to-noise ratio, "*R−Y*"[6] belts produced more errors than did word belts. These former belts were therefore used in evaluation of the signal-to-noise capabilities of the MFS system. Two types of frequency shift converters were used for the normal teletype tests; one being the standard type CV-31c/TRA7 that converts the input frequency shift signal to a signal centered around 50 kilocycles. In this unit the frequency shift is detected by means of a slope discriminator. The entire unit is self-contained with its own teletype driver. The other equipment comprised a frequency shift system whereby the signals from the reciever were at an audio frequency centered around 2,550 cycles, with mark 2,125 cycles and space 2,975 cycles. The usual elements of such a system were used including a band-pass filter, limiter, discriminator, and a teletype driver which drives the teletype unit. When the bandwidths of the two converters are substantially equal the results are much the same.

These curves again show the normal sharply-breaking characteristics of a frequency shift system using a limiter. The error rate has been shown to go from almost no errors to over 100 per 1,000 characters with a signal-to-noise ratio change of 3 decibels or less. In operating practice it has been found that a frequency shift system will give nearly perfect teletype copy provided the signal-to-noise ratio never falls below plus 6 decibels. The results shown on these curves substantiate this experience in that 6 decibels would allow a margin of 3 or 4 decibels before the system starts to break. The performance of the system using the sextuple code is substantially better than the usual frequency shift radio teletype. The systems improvement is 5 to 6 decibels, which compares well with the theoretical calculations.

Fig. 14 shows the performance of the systems under impulse noise. The improvement of the sextuple system is somewhat higher for impulse noise than it is for white noise. The gain is 9 to 10 decibels.

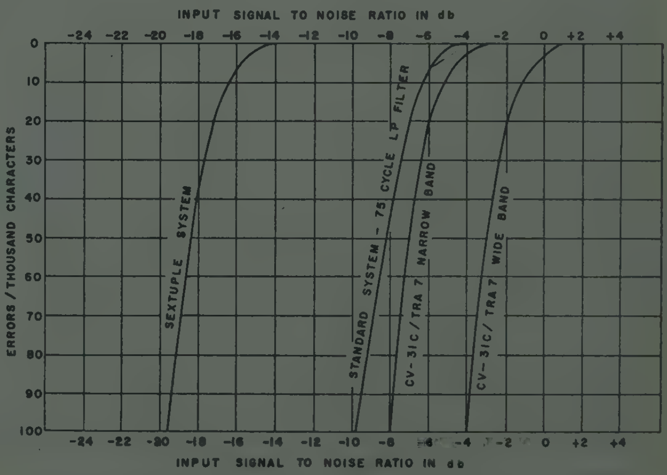


Fig. 14—Frequency shift performance in impulse noise.

Since the work described did not cover an actual air test no measurements have been made of multipath effects, but it is anticipated that marked improvements would result due to the long pulses that are used.

---

[6] Continuous circular tape on which letters *R-Y-R-Y*, etc. are punched in code. These put maximum load on switching circuit.

CONCLUSION

Laboratory performance tests of the sextuple MFS system clearly indicate the inherent superiority of MFS over FSK for the transmission of teletype information under white and impulse type noise conditions. The performance of the standard FSK system with the comb input filter was found to be approximately 2 decibels better than the same system with the standard input filter. Since the effective bandwidth of the comb filter is approximately the same as the bandwidth of the sextuple MFS input filter, it can be seen that the MFS system is about 4 decibels better than the FSK system with equivalent pre-detection bandwidths. This improvement is mainly due to a reduction of bandwidth which is permissible with the greater pulse duration in the MFS system. This greater pulse duration is achieved without a reduction in the speed of transmission of information. A slight additional improvement results from the simpler code used by the MFS system. Theoretical gains have been satisfactorily verified.

ACKNOWLEDGMENT

The authors wish to recognize Messrs. D. R. Meierdiercks, F. Picus, and W. Posner, for considerable aid in the theoretical and experimental efforts. The work described in this paper was sponsored by the U. S. Air Force under Contract AF33(038)-22536.

The Use of a Ring Array as a Skip Range Antenna[*]

J. D. TILLMAN[†], MEMBER, IRE, W. T. PATTON[†], MEMBER, IRE, C. E. BLAKELY[†], AND
F. V. SCHULTZ[†], SENIOR MEMBER, IRE

Summary—The problem involved here is the development of a shore antenna for shore-to-ship communications at distances from 40 to 500 miles. The difficulty at these distances is due to interference between ground-wave and sky-wave modes of propagation.

The propagation factors involved are considered and it is shown that (1) A frequency less than 3.3 mc should be used, (2) The ground wave should be used during the day and (3), The sky wave should be used at night.

An azimuthally omnidirectional antenna is described which consists of vertical monopoles equally spaced around the circumference of a circle. The antenna can be excited in either of two ways, one of which concentrates the radiated energy along the ground for use with the ground wave, and the other of which gives maximum radiation at a polar angle of 30 degrees and a null in the ground plane for use with the skywave. The results of model tests at 30 mc and at 1,200 mc are given. Results of calculations showing the expected coverage for noon and midnight are included.

INTRODUCTION

IT IS THE purpose of this paper to describe an antenna system to be used to transmit signals over the range from 40 to 500 miles. This antenna is intended primarily for shore-to-ship communication, so that the ground paths involved will consist mainly of sea water. Reliable operation for 24 hours each day and for any season or geographical location is required.

Communication into the region within 500 miles of the transmitter is characterized by severe fading. This fading is the result of interference between ground-wave and sky-wave fields which are of the same order of magnitude over part of the region. The zone in which this severe fading and interference occurs is normally about 100 miles across, and is located at about 200 miles from the transmitter at night, and at about 600 miles during the day. The question of obtaining an adequate signal-to-noise ratio is the same for this system as for any other, and the principal problem is one of eliminating interference between ground-wave and sky-wave modes of propagation. This is accomplished by the use of an antenna which can be excited in either of two ways:

1. A ground-wave phasing which gives a pattern concentrating the radiated energy along the surface of the earth for communication via the ground wave.
2. A sky-wave phasing which eliminates any ground wave by means of a null at zero degrees elevation angle and concentrates the radiated energy about an elevation angle of 60 degrees for communication via the sky wave.

In each case the radiation pattern is omnidirectional in azimuth. The ground-wave phasing is used to communicate during the day and for distances of less than about 200 miles at night. The sky-wave phasing is used at night for distances greater than about 100 miles.

PROPAGATION CONSIDERATIONS

The antenna is to be used for a particular communication link, so that rather specific antenna requirements can be determined by a consideration of propagation factors. The important considerations are

1. Skip distance.
2. Ground-wave intensity-to-sky-wave intensity ratio.
3. Signal-to-noise ratio.

Since the reason for investigating these factors is to establish criteria for the design of the antenna, the methods of computing sky-wave field intensities and skip distances given in CRPL Circular No. 462[1] are considered to be sufficiently accurate. This circular also contains noise data which are adequate for this purpose. Ground wave field intensities can be found by using well known methods.[2] These factors must be used to select an operating frequency and to determine the required vertical radiation pattern of the antenna.

---

[*] Original manuscript received June 17, 1955, revised manuscript received, August 8, 1955. The research reported in this paper has been sponsored by the Bureau of Ships, Dept. of the Navy.

[†] Electrical Engineering Dept., University of Tennessee, Knoxville, Tenn.

For daytime the use of a frequency near two megacycles per second is indicated, as both sky-wave interference and noise go through a minimum with respect to frequency in this range. The use of frequencies below about one megacycle per second is undesirable at night because a large number of fairly strong multi-hop sky-wave modes are excited simultaneously, and intermode interference is correspondingly severe. A further undesirable factor is the excessive size of the required antenna structure at these relatively low frequencies. An upper limit on the nighttime frequency can be set by stipulating that the skip distance must never exceed the distance that can be covered by the ground wave if there is no sky-wave interference. This insures coverage by one mode or the other. These distances for a sunspot minimum are plotted against frequency in Fig. 1, and it is seen that the highest frequency that may be used for all conditions is 3.3 megacycles per second. This frequency will be used for all following calculations in this paper.

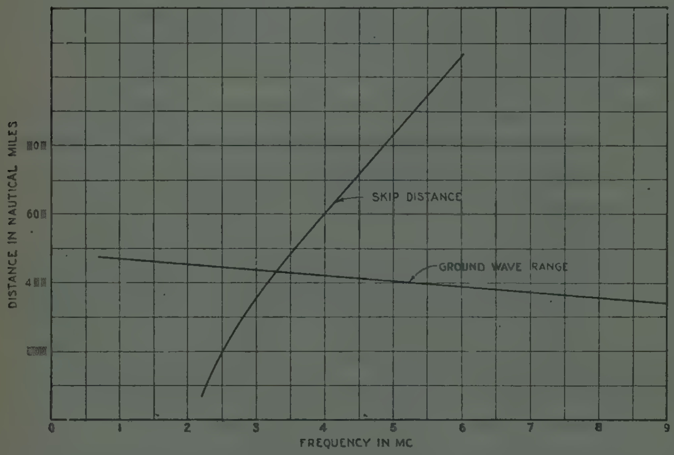


Fig. 1—Skip distance and ground wave range vs frequency. The ground-wave range is for a 5-kilowatt transmitter located 2 miles from a straight coast, and is based on no interfering sky wave.

Calculations of relative ground-wave and sky-wave field intensities show that for daytime conditions ionospheric absorption reduces sky-wave interference to a point where the ground-wave communication is satisfactory without requiring a pattern greatly sharper than that of a quarter-wave monopole. At night the sky wave is relatively unabsorbed, and is strong enough to override noise at distances greater than about 100 miles from the transmitter. To reduce the ground-wave intensity sufficiently so that it will not interfere with the sky wave requires a null in the antenna pattern at the ground plane, thus eliminating the ground wave. This null must exist for all azimuth angles or the region of interference-free coverage will be a narrow wedge-shaped area. This in turn implies that the azimuthal radiation pattern at all polar angles be omnidirectional, unless excessively complicated antennas are used. Maximum radiation should be at about a 60-degree elevation angle, corresponding to a 1-HOP-F2 distance of about 200 nautical miles, thus concentrating the field in the desired area. The region out to the point where the sky wave is strong enough to override noise must be covered via the ground wave. Since the sky wave is relatively strong at night, the ground-wave phasing of the antenna should concentrate the enregy along the surface as much as possible to keep interference to a minimum.

THE ANTENNA SYSTEM

The antenna requirements set out above can be met by an array of vertical elements equally spaced around the circumference of a circle. The use of such an array to obtain patterns having little radiation at high angles was proposed by Chireix,[3] by Hansen and Hollingsworth,[4] and, in a somewhat different form, by Page.[5] This array can also be excited in such a way as to give the pattern desired for sky-wave communication.

It is shown in the Appendix that the pattern of such an array of quarter-wave monopoles is given by

$$E = I_0 J_n\left(\frac{2\pi\rho}{\lambda}\sin\theta\right)\frac{\cos\left(\frac{\pi}{2}\cos\theta\right)}{\sin\theta}\epsilon^{j(\omega t+n\phi)}, \quad (1)$$

where each of the m elements has a current I_0/m, and there is a progressive phase difference $2\pi n/m$ between adjacent elements. $J_n(x)$ is the Bessel function of the first kind of order n. The angles θ and ϕ are shown in Fig. 7. The use of (1) assumes that m is larger than the critical value specified in the Appendix. In (1) choose $n=0$. A null in the ground plane (at $\theta=90°$) can then be obtained by setting $2\pi\rho/\lambda$ equal to any root of $J_0(x)=0$. The smallest radius giving this null is $\rho=0.383\lambda$. See pattern for this case in Fig. 2 (opposite). Inspection shows that this pattern meets the requirements for the sky-wave phasing. Since the phase difference between adjacent elements is $2\pi n/m$, and $n=0$, all of the currents are in phase for this method of excitation.

To obtain a vertical pattern giving better sky-wave suppression than given by the elements of the array, it is necessary that $2\pi\rho/\lambda$ be less than the value of x for the first maximum of $J_n(x)$. This insures that $J_n(2\pi\rho/\lambda \sin\theta)$ is a monotone increasing function of θ.

---

[1] "Ionospheric Radio Propagation," U. S. Dept. of Commerce, Nat. Bur. Standards Circ. No. 462; June, 1948.

[2] "Ground Wave Field Intensities," Signal Corps Propagation Unit, Tech. Rep. No. 3; June 1949.

[3] H. Chireix, "Antennes a rayonnement zenithal reduit," *L'Onde Elect.*, vol. 15, pp. 440–456; July, 1936.

[4] W. W. Hansen and L. M. Hollingsworth, "Design of 'flat-shooting' antenna arrays," PROC. IRE, vol. 27, pp. 137–143; Feb., 1939.

[5] H. Page, "Ring aerial systems," *Wireless Eng.*, vol. 25, pp. 308–315; October, 1948.

For $\rho=0.383\lambda$, this requires that $n \geqq 2$. In an antenna of this size a value of $n>3$ leads to undesirable supergain characteristics.[6] Then the value of $n=3$ is the best for the present purpose. This pattern is also shown in Fig. 2.

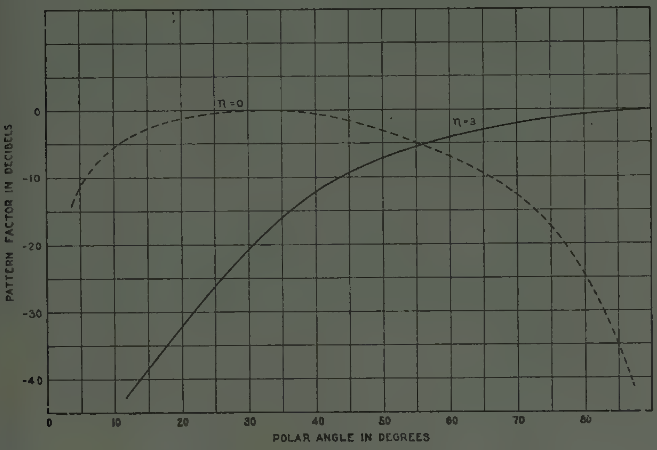


Fig. 2—Vertical pattern of a single-ring array of quarter-wave monopoles with a radius of 0.383 wavelength.

Eq. (18) in the Appendix can be used to fix m. Nine elements are needed for $\rho=0.383\,\lambda$ and $n=3$. Gains may be calculated by the method due to Page.[7] For $n=0$, the gain is 5.94 decibels, and for $n=3$ it is 2.57 decibels.

EXPERIMENTAL VERIFICATION

A model of the antenna was constructed and tested at 1,200 mc. Azimuthal patterns at a number of polar angles were obtained for both methods of excitation by means of a pattern recorder. Vertical patterns were obtained by point-by-point measurements. Experimental data together with calculated values are shown in Figs. 3–6 on the following page. The agreement with theory is seen to be quite good.

The final antenna will consist of nine folded monopoles equally spaced about the circumference of a circle. At 3.3 mc, the radius of the circle is 114 feet, and the elements are 75 feet high. It is planned to feed the elements with coaxial cables emanating from the center of the ring where the matching and phasing network are to be located. The antenna was also modeled at 30 mc to investigate these lumped circuit driving networks. This study showed that each phasing of the antenna could be excited by a network containing three T-sections, and that the current in each element could be set to within the required tolerance without undue difficulty.

PROPAGATION CALCULATIONS

The probable ranges that can be covered using this antenna have been calculated. These calculations are based on a required signal-to-noise ratio of 10 decibels and a 10-decibel separation of ground-wave and sky-wave modes of propagation, both of which are adequate for teletype. Allowance has been made for fading, assuming a Rayleigh distribution for the sky-wave field intensity. The calculations were made for a transmitter power of 3 kw and an over-all efficiency of 50 per cent. The antenna was considered to be located two nautical miles inland from a straight coast line. Ranges for noontime conditions are shown in Table I and for midnight in Table II. The data in Table II are the range using the ground-wave phasing, and the inner and outer limits of coverage using the sky-wave phasing.

TABLE I

RANGES IN NAUTICAL MILES AT NOON FOR A SINGLE-RING ARRAY LOCATED TWO MILES FROM A STRAIGHT COAST

Calculations are based on 3 kw transmitter and a frequency of 3.3 mc.

Azimuth angle	Noise Grade 1	Noise Grade 2	Noise Grade 3	Noise Grade 4	Noise Grade 5
0	690	690	690	560	430
30	670	670	670	550	420
60	560	560	560	490	360

TABLE II

RANGES IN NAUTICAL MILES AT MIDNIGHT FOR A SINGLE-RING ARRAY LOCATED TWO MILES FROM A STRAIGHT COAST

Calculations are based on 3 kw transmitter and a frequency of 3 mc.

Azimuth angle	Antenna phasing	Noise Grade 1W	Noise Grade 2W	Noise Grade 3W	Noise Grade 4	Noise Grade 5
0	G	204	204	204	204	204
	S	40 1000+	61 930	91 630	148 420	N N
30	G	195	195	195	195	195
	S	40 1000+	61 930	91 630	148 420	N N
60	G	165	165	165	165	165
	S	40 1000+	61 930	91 630	148 420	N N

---

[6] L. J. Chu, "Physical Limitations of Omnidirectional Antennas," MIT Tech. Rep. No. 64, pp. 11–21; May, 1948.

[7] H. Page, "Radiation resistance of ring aerials," *Wireless Eng.*, vol. 25, pp. 102–109, April, 1948.

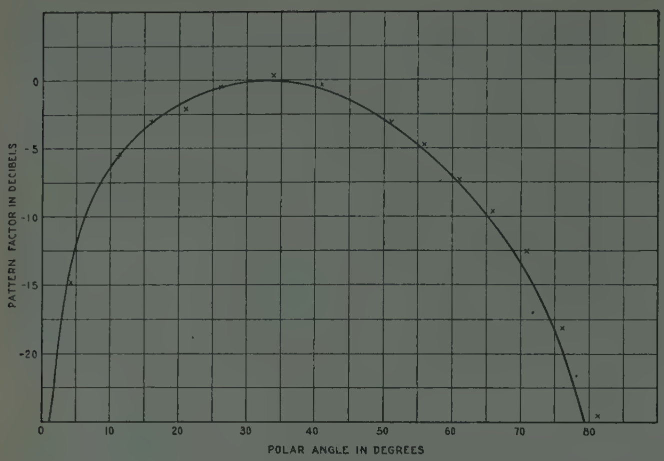


Fig. 3—Measured and calculated vertical patterns of a single-ring array of quarter-wave monopoles with a radius of 0.383 wavelength and $n=0$.

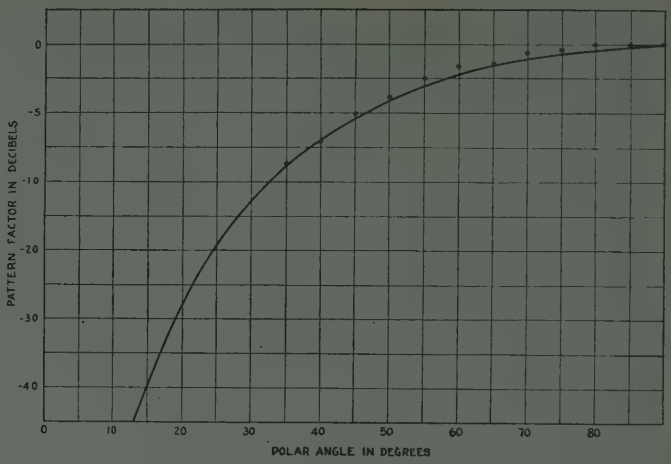


Fig. 4—Measured and calculated vertical patterns of a single-ring array of quarter-wave monopoles with a radius of 0.383 wavelength and $n=3$.

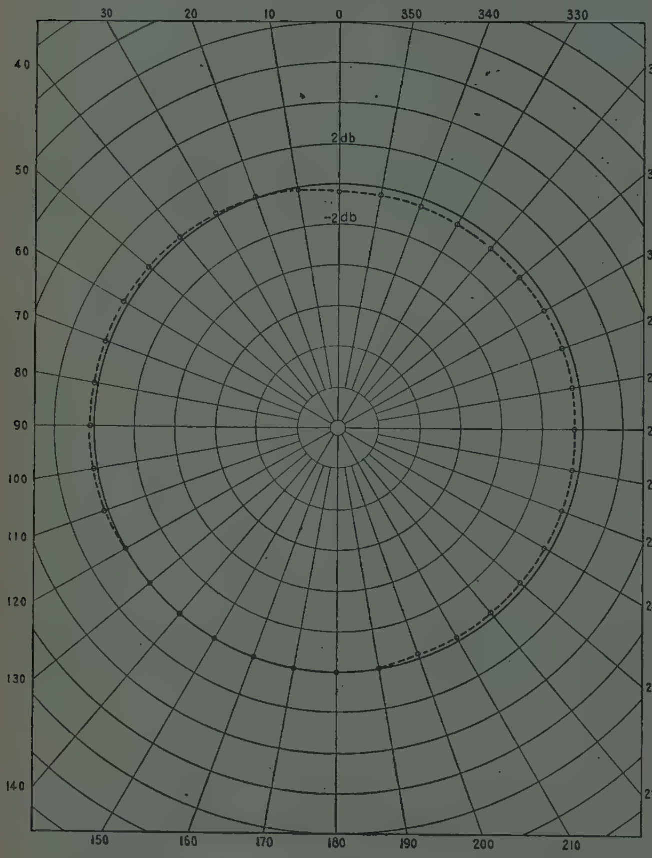


Fig. 5—Measured and calculated horizontal pattern at $\theta=30$ degrees of a single-ring array of quarter-wave monopoles with a radius of 0.383 and $n=0$.

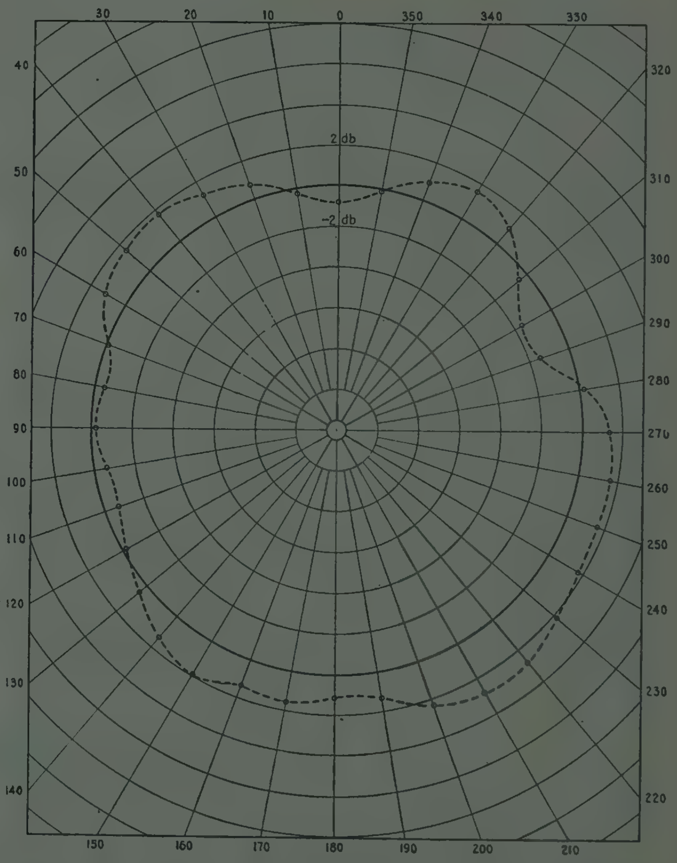


Fig. 6—Measured and calculated patterns of a single-ring array of quarter-wave monopoles with a radius of 0.383 wavelength and $n=3$.

The letter N is used to indicate that a signal-to-noise ratio of 10 decibels does not exist at any point in the 0-to-500-mile region. Calculations were also carried out for a large number of other cases. These include:

1. Sporadic E-mode present.
2. Ionospheric absorption abnormally high.
3. Twilight conditions.
4. Arctic ionospheric and noise conditions.

In each case the results are acceptable.

CONCLUSIONS

The antenna system described in this paper appears to offer a method of obtaining reliable shore-to-ship communication over distances of less than 500 miles without the customary fading caused by interference between ground-wave and sky-wave fields. This absence of interference is quite valuable where extreme accuracy of reception of the transmitted signal is required.

APPENDIX

DERIVATION OF THE EXPRESSION FOR THE ARRAY FACTOR

A plan view of the m element array is shown in Fig. 7. Establish a spherical co-ordinate system, with the polar axis perpendicular to the plane of the circle, and choose $\phi=0$ through element m. Let the radius of the circle be 7. To obtain patterns of the type desired let the current in the ith element be

$$I_i = \frac{I_0}{m}\epsilon^{j(\omega t+(2\pi n/m)i)}, \tag{2}$$

where n is any positive integer or zero. There is thus a uniform progressive phase shift between adjacent elements, with n complete cycles of phase shift around the ring. The field from the ith element is proportional to

$$E_i = \frac{I_0}{m}\epsilon^{j[\omega t+(2\pi n/m)i+2\pi\rho/\lambda \sin\theta\cos(\phi-(2\pi/m)i)]}. \tag{3}$$

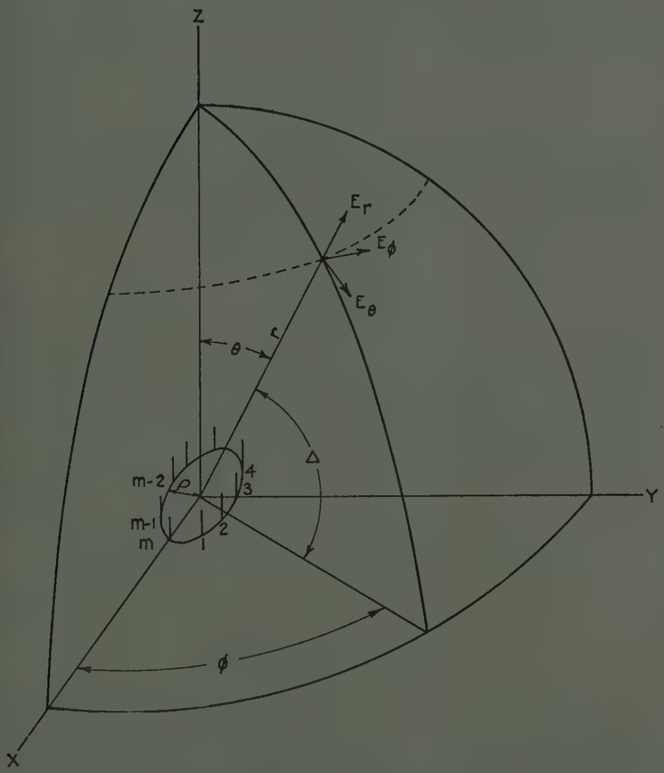


Fig. 7—View of a single-ring array lying in the r, ϕ, $\theta=0$ degrees plane of a spherical co-ordinate system.

The array factor is then found by summing E_i from 1 to m. This gives

$$E = \frac{I_0}{m}\epsilon^{j(\omega t+n\phi)}\sum_{i=1}^{m}\epsilon^{j(z\cos\eta_i-n\eta_i)}, \tag{4}$$

where

$$z = \frac{2\pi\rho}{\lambda}\sin\theta$$

$$\eta_i = \phi - \frac{2\pi}{m}i. \tag{5}$$

The summation in (4) has been investigated by Stenzel[8] for $n=0$ and m even, by Chireix,[9] for $n\neq 0$ and m even, and by Page[10] for $n=0$ and m even or odd. A general development follows that holds for each of these cases and also for $n\neq 0$ and m odd. We must investigate

$$S_m = \sum_{i=1}^{m}\epsilon^{j(z\cos\eta_i-n\eta_i)}. \tag{6}$$

This may be expanded in a series of Bessel functions,[11] giving

$$S_m = \frac{J_0(z)}{m}\sum_{i=1}^{m}\epsilon^{-jn\eta_i}+2\sum_{i=1}^{m}\sum_{k=1}^{\infty}\epsilon^{-jn\eta_i}\big[(-1)^k\cos 2k\eta_i J_{2k}(z)$$
$$+j(-1)^{k-1}\cos(2k-1)\eta_i J_{2k-1}(z)\big]. \tag{7}$$

Each term of (7) may be considered separately. Let

$$S_1 = \frac{1}{m}\sum_{i=1}^{m}\epsilon^{-jn\eta_i}J_0(z), \tag{8}$$

$$S_2 = \frac{2}{m}\sum_{i=1}^{m}\sum_{k=1}^{\infty}\epsilon^{-jn\eta_i}(-1)^k\cos 2k\eta_i J_{2k}(z), \tag{9}$$

$$S_3 = \frac{2}{m}\sum_{i=1}^{m}\sum_{k=1}^{\infty}\epsilon^{-jn\eta_i}(-1)^{k-1}\cos(2k-1)\eta_i J_{2k-1}(z). \tag{10}$$

Now in each case these sums reduce to geometric progressions. The first is

$$S_1 = \frac{1}{m}\sum_{i=1}^{m}J_0(z)\epsilon^{-jn\phi}\epsilon^{j(2\pi n/m)i}$$
$$= \frac{J_0(z)}{m}\epsilon^{-jn\phi}\sum_{i=1}^{m}\epsilon^{j(2\pi n/m)i}$$
$$= \frac{J_0(z)}{m}\epsilon^{-jn\phi}\frac{\sin\pi n}{\sin(\pi n/m)}\epsilon^{j(m+1/m)\pi n}. \tag{11}$$

If $m>n$, which is the only practical case, and $n\neq 0$, $S_1=0$. If $n=0$, $S_1=J_0(z)$. Thus,

$$S_1 = \begin{cases} J_0(z) & n=0 \\ 0 & n\neq 0. \end{cases} \tag{12}$$

For S_2 we obtain, by reversing the order of summation, and by a simple algebraic manipulation, that

$$S_2 = \frac{1}{m}\sum_{k=1}^{\infty}(-1)^k J_{2k}(z)\sum_{i=1}^{m}\big[\epsilon^{j(2k-n)\phi}\epsilon^{j(n-2k)(2\pi/m)i}$$
$$+\epsilon^{-j(2k+n)\phi}\epsilon^{j(n+2k)(2\pi/m)i}\big]. \tag{13}$$

S_2 may now be expanded by the use of the expression for the sum of a geometric progression, giving

---

[8] H. Stenzel, "Über die richtcharakteristik von in einer Ebene Angeordneten Strahlern," *Electr. Nachr. Technik*, vol. 6, pp. 165–181; May, 1929.

[9] Chireix, *loc. cit.*

[10] Page, *loc. cit.*

[11] G. N. Watson, "Theory of Bessel Functions," Cambridge University Press, Cambridge, England, pp. 22–23; 1944.

$$S_2=\frac{1}{m}\sum_{k=1}^{\infty}(-1)^k J_{2k}(z)$$
$$\cdot\left[\epsilon^{j(2k-n)\phi}\epsilon^{j(m+1/m)(n-2k)\pi}\frac{\sin(n-2k)\pi}{\sin(n-2k)\pi/m}\right.$$
$$\left.+\epsilon^{-j(2k+n)\phi}\epsilon^{j(m+1/m)(n+2k)\pi}\frac{\sin(n+2k)\pi}{\sin(n+2k)\pi/m}\right]. \quad (14)$$

In (14) n and m are integers and k takes on only integral values. Then the only values of k which give rise to nonzero terms are those for which

$$k=-\frac{lm-n}{2} \quad \text{or} \quad k=\frac{lm-n}{2}.$$

There are four cases: n odd, m odd; n even, m odd; n odd, m even; and n even, m even. The algebra for each of these cases is straightforward but tedious and will not be given here. The summation for S_3 can be carried out in the same way as for S_2. When this is done, the result obtained by adding S_1, S_2, and S_3 is the same for all four cases although different terms come from S_1, S_2, and S_3 for each case. The final expression for the array factor is

$$E=j^nI_0J_n\left(\frac{2\pi\rho}{\lambda}\sin\theta\right)\epsilon^{j(\omega t+n\phi)}$$
$$+I_0\sum_{k=1}^{\infty}\left\{j^{km-n}J_{km-n}\left(\frac{2\pi\rho}{\lambda}\sin\theta\right)\epsilon^{j[\omega t+(n-km)\phi]}\right.$$
$$\left.+j^{km+n}J_{km+n}\left(\frac{2\pi\rho}{\lambda}\sin\theta\right)\epsilon^{j[\omega t+(km+n)\phi]}\right\}. \quad (15)$$

For $n=0$, this reduces to

$$E=I_0J_0\left(\frac{2\pi\rho}{\lambda}\sin\theta\right)\epsilon^{j\omega t}$$
$$+2I_0\epsilon^{j\omega t}\sum_{k=1}^{\infty}j^{km}\cos km\phi J_{km}\left(\frac{2\pi\rho}{\lambda}\sin\theta\right). \quad (16)$$

The azimuthal pattern at polar angle θ will be circular if

$$J_{m-n}\left(\frac{2\pi\rho}{\lambda}\sin\theta\right)\ll J_n\left(\frac{2\pi\rho}{\lambda}\sin\theta\right), \quad (17)$$

where terms for $k\geqq 2$ are neglected because of the rapid decrease of $J_k(x)$ with increasing k. The peak-to-peak variation in the pattern in db is

$$\text{VAR}=20\log\frac{\left|J_n\left(\frac{2\pi\rho}{\lambda}\sin\theta\right)\right|+\left|J_{m-n}\left(\frac{2\pi\rho}{\lambda}\sin\theta\right)\right|}{\left|J_n\left(\frac{2\pi\rho}{\lambda}\sin\theta\right)\right|-\left|J_{m-n}\left(\frac{2\pi\rho}{\lambda}\sin\theta\right)\right|}. \quad (18)$$

If $n=0$, (18) is valid for m even, but if m is odd the term for $k=1$ is in quadrature with the principal term and

$$\text{VAR}=10\log\frac{\left[J_0\left(\frac{2\pi\rho}{\lambda}\sin\theta\right)\right]^2+\left[J_m\left(\frac{2\pi\rho}{\lambda}\sin\theta\right)\right]^2}{\left[J_0\left(\frac{2\pi\rho}{\lambda}\sin\theta\right)\right]^2}. \quad (19)$$

If m is large enough so that the use of (18) or (19) shows that the azimuthal pattern is essentially a circle, the term for $k=1$ can also be neglected and

$$E=j^nI_0J_n\left(\frac{2\pi\rho}{\lambda}\sin\theta\right)\epsilon^{j(\omega t+n\phi)}. \quad (20)$$

This is the expression for the pattern of an array of isotropic radiators, and must be multiplied by the expression for the pattern of the individual elements to obtain the equation of the final pattern.

* * *

Microwave High-Speed Continuous Phase Shifter*

W. SICHAK†, MEMBER, IRE, AND D. J. LEVINE†, MEMBER, IRE

Summary—**A continuous phase shifter using circularly polarized helices in a circular waveguide is described. The phase shifter is smaller than previous types[1] and has an insertion loss of less than 0.2 db. Equations for the phase-shift error and the amount of amplitude modulation produced due to reflections and elliptical polarization are derived. Errors less than ±2° can be obtained over a 3 per cent frequency band. A 9,400-mc model designed to rotate at 3,600 rpm is $5\frac{1}{2}$ inches long and 1 inch in diameter, excluding the motor drive.**

THEORY OF OPERATION

IT CAN BE shown that the phase of the output voltage of a circularly polarized antenna receiving a circularly polarized wave is directly proportional to the angle of rotation of the antenna about its longitudinal axis. In order to make a phase shifter, two circularly polarized antennas (each of the same screw sense) are mounted in a circular waveguide, and one antenna is rotated about its axis at the required rate.

Errors

Axial-Ratio Error: The relation between the maximum phase error and the axial ratios of the antennas is

$$\tan \Delta_{\max} = \frac{K-1}{2\cdot K^{1/2}}, \qquad (1)$$

$$K = \frac{A+B}{1+AB},$$

where A and B are the axial ratios of the antennas and Δ is the error.

This relation is plotted in Fig. 1(a) for the case where the axial ratios are equal. An axial ratio of 2 db produces an error of less than 1 degree.

Standing-Wave Error: It can be shown that the maximum phase-shift error $\Delta_{\max}$ is given by

$$\tan \Delta_{\max} = \frac{2P^2(1-P^4)^{1/2}}{1-2P^4}, \qquad (2)$$

where P = reflection coefficient of each end.

This equation is plotted in Fig. 1(b). A standing-wave ratio of 1.2 at each end causes an error of about 1 degree.

Variation in Output Amplitude

The ratio of maximum to minimum received voltage obtained when an elliptically polarized antenna is rotated in an elliptically polarized field[2] is $(1+AB)/(A+B)$, where A and B are the axial ratios of the antennas.

For equal axial ratios, the percentage modulation m is 100 $(1-A)^2/(1+A)^2$. This equation is plotted in Fig. 1(c). Axial ratios of 2 db produce 1.3 per cent modulation.

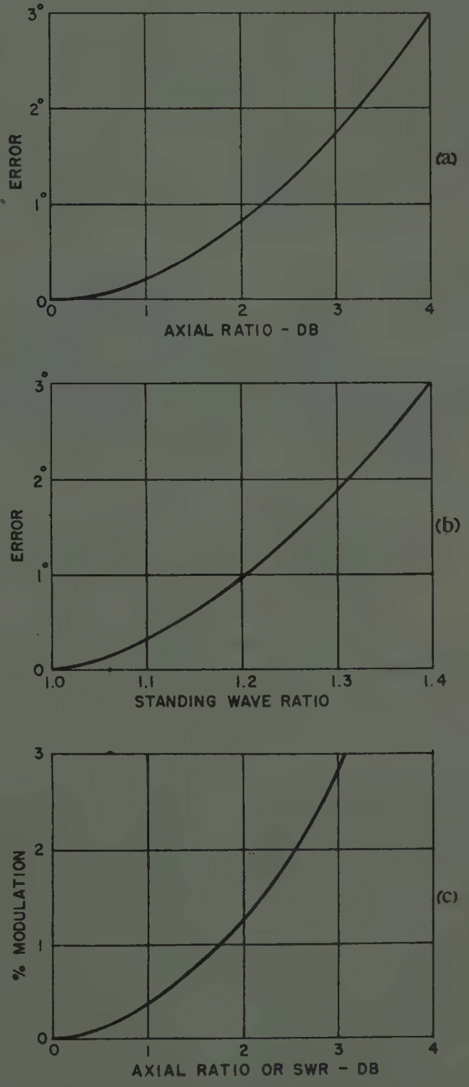


Fig. 1—(a) Phase-shift error vs axial ratio of each end. (b) Phase-shift error vs standing-wave ratio. (c) Percentage modulation of the phase-shifted wave vs axial ratio of each end or standing-wave ratio.

If the ends of the phase shifter are equally mismatched, the ratio of maximum to minimum voltage is $(1+r^2)/2r$. The percentage modulation is 100 $(r-1)^2/(r+1)^2$.

---

* Original manuscript received by the IRE, May 29, 1951; revised manuscript received, January 10, 1952; resubmitted June 27, 1955. The work described in this paper was sponsored by the Bureau of Ordnance, Navy Department.

† Federal Telecommunication Laboratories, Inc., 500 Washington Ave., Nutley, N. J.

[1] A. G. Fox, "An adjustable wave-guide phase changer," PROC. IRE, vol. 35, pp. 1489–1498; December, 1947.

[2] "Reference Data for Radio Engineers," Federal Telephone and Radio Corp., New York, N. Y., third edition, page 366; 1949.

The amplitude-modulation sidebands in the output are separated from the carrier by twice the rotational frequency of the phase shifter, since the input standing-wave ratio is the same whether the phase shift is θ or $180°+\theta$. The reflected wave consists of two parts: the first, due to the mismatch at the input end, is independent of rotation; the second, due to the mismatch at the load end, is shifted in frequency by twice the rotational frequency. If the load end of the phaseshifter, including the helix, is perfectly matched and has an axial ratio of unity, there are no amplitude or phase errors in the output.

For simplicity, the above analyses have considered the effects of axial ratio and standing-wave ratio separately. For small errors, the maximum errors due to each can be added directly.

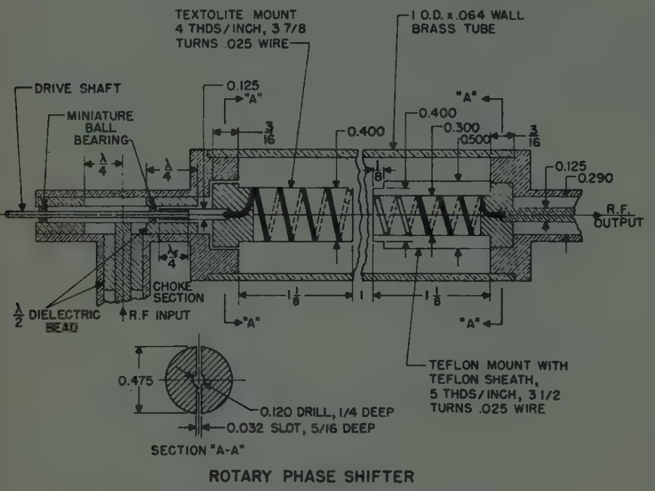


Fig. 2—Rotary phase shifter.

ROTARY PHASE SHIFTER

Description

The rotary phase shifter shown in Figs. 2 and 3, takes the form of a length of circular waveguide terminated in a helical circularly polarized H_{11}-mode launcher at each end. The 9,400-mc model is about $5\frac{1}{2}$ inches long and 1 inch in diameter, not including the motor. The mass of the rotating textolite helix and its drive shaft is 5 grams. The sense of each helix is the same. The exploded view of Fig. 3 illustrates two types of helices; the textolite unsheathed helix at the rotating end and a fixed sheathed teflon helix. The helix spacing is about one inch between ends. It was found that a shorter spacing resulted in direct coupling between the ends of the helices and resulted in large errors.

These phase shifters can be rotated at speeds higher than 3,600 rpm if desired. The phase-shift rate can be doubled by rotating the helices in opposite directions.

Helix Design and Construction

For use in this phase shifter, the helical-antenna design problem is complicated by the fact that the helix radiation field must be contained in a circular waveguide. It was decided to radiate an H_{11} mode in a circular waveguide dimensioned below cutoff for all higher modes. In this way, modes that introduce errors are avoided.

Several types of dielectric-mounted helices were built with axial ratios less than 2 db and vswr less than 2 on a 50-ohm line. These helices were tested by rotating a small probe on the periphery of a circular waveguide terminated in a crossed tapered resistive-strip load.

The helix dimensions fell within the limits of Kraus' data,[3] although they were found to be more critical than the air-supported-helix dimensions.

Experimental work on the helices indicated that the axial ratio was critically dependent on the length of wire used. For example, a $\frac{1}{8}$-inch change in wire length can result in a 2-db axial-ratio change. However, once the axial ratio is reduced to about 1 db and the impedance is properly matched, the complete helix assembly exhibits good frequency response. The typical response curves of Fig. 4 are for the teflon-mounted helix matched with a quarter-wave transformer.

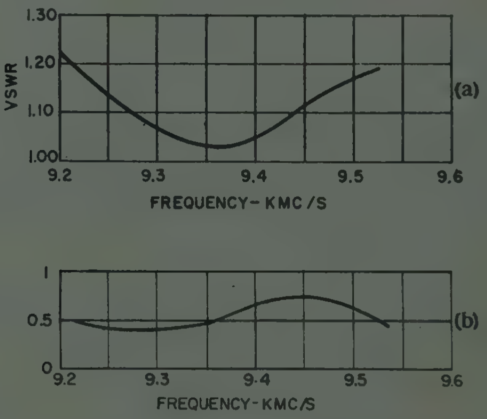


Fig. 4—(a) Standing-wave ratio of one helix vs frequency. (b) Axial ratio of one helix vs frequency.

The helix mounting method is quite important because of eccentricity errors. It was difficult to estimate the maximum permissible eccentricity, but if the helix end exhibits a peak-to-peak amplitude of less than 0.010

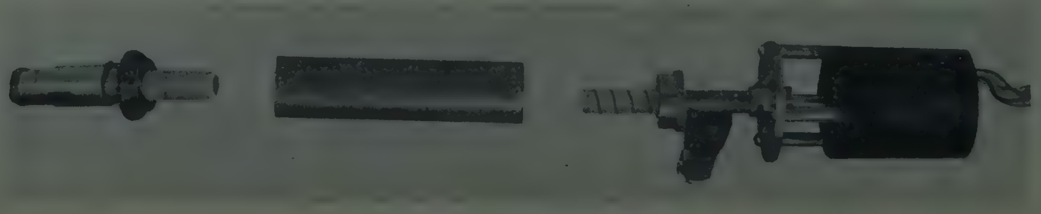


Fig. 3—Exploded view of phase shifter.

---

[3] J. D. Kraus, "Antennas," McGraw-Hill Book Co., New York, N. Y., chap. 7; 1950.

inch when the drive is rotated, then errors due to eccentricity should be small.

The total phase error to be expected from the use of this rotary phase shifter can be estimated from the apparent axial ratio (eccentricity and guide asymmetry give apparent axial ratios other than unity even if the helices are perfect) and the vswr seen from the phase shifter looking in each direction from the center of the circular waveguide. Note that this means the vswr plotted in Fig. 1 is the combined vswr of the helix and its load. Thus, referring to Fig. 4 and assuming that each helix has the same axial ratio and vswr, from Figs. 1(a) and 1(b), the sum of the two phase errors at 9.2 and 9.5 kmc is less than 1.5°.

The insertion loss of the phase shifter is less than 0.2 db, caused by vswr and normal wall losses.

Rotary-Phase-Shifter Tests

The phase-shifting characteristics were measured on a circuit similar to the usual phase-measuring arrangements but without using an air path.[4,5] These tests indicate very sharp (about 2° wide) resonant-absorption and phase-shift-discontinuity regions, 180° apart. This was attributed to a resonance of the small wrong-sense (for the helices) waves set up in the phase-shifter cavity. To suppress this, called for either ideal circular polarization launchers or a "wrong-sense" suppressor. The latter was tried in the form of loss-loaded slots cut in the circular waveguide so as to afford minimum interference with wall currents set up by the fields of the desired screw sense. The slots act as partial suppressors for the unwanted sense of rotation. Such a procedure reduced the amplitude of the transmission loss at the resonant points from 13 to 1.5 db. At nonresonant points, the transmission loss was less than 0.2 db.

CONCLUSION

A continuous rotary phase shifter employing helical circularly polarized H_{11} axial-mode launchers in a circular waveguide has been built and tested. Investigation of the errors involved and measurements indicate that the phase errors can be made less than ±2° maximum.

ACKNOWLEDGMENT

Acknowledgment is due to A. J. Lombardi for the mechanical design of the phase shifters and to A. T. Brown for making some of the measurements.

---

[4] J. D. Kraus, "Antennas," McGraw-Hill Book Co., New York N. Y., p. 452; 1950.

[5] C. G. Montgomery, "Techniques of Microwave Measurements," McGraw-Hill Book Co., New York, N. Y., vol. 11, MIT Series, p. 916, Fig. 15.6; 1947.

A Comparison of Two Radiometer Circuits*

S. J. GOLDSTEIN, JR.†, ASSOCIATE MEMBER, IRE

***Summary*—The detection of weak thermal radiation and similar noise-like signals is often limited by the internal noise of the receiving apparatus. Dicke has described a method of detecting such signals. It employs a mechanical modulator at the input of a wide-band superheterodyne receiver. The detected output of the receiver is multiplied by a voltage of the same frequency as that which actuates the modulator, and filtered to produce a dc voltage when an external signal is present. Another method has been proposed which uses two independent receivers. The undetected output voltages are cross-correlated, and the correlator yields a dc voltage when a signal is applied to both receivers. Each method can be used to measure the intensity of signals small in amplitude compared to the noise of the receiver. A mathematical model of each of the circuits is presented, using, insofar as possible, the same assumptions; and equations derived for the least detectable signal power of each. The two-receiver method has, under the assumptions made, somewhat greater sensitivity. Engineering problems associated with each of the radiometers are discussed.**

INTRODUCTION

A RECEIVER designed to monitor near-sinusoidal signals can usually be made to have an adequate signal-to-noise ratio by narrowing the bandwidth to exclude the thermal and shot noise of the receiver. This process depends on the fact that the signal spectrum is sharply peaked while the noise has a nearly uniform spectrum. But shaping the band-pass of a receiver for thermal radiation or other noise-like signals has no such effect, because the spectra are practically indistinguishable.

The first of the methods to be described "identifies" the signal spectrum by modulating it before it is fed to the receiver. The second distinguishes between the signal and noise by virtue of the fact that the noise in independent receivers will be uncorrelated.

Radiometers of the kind described by Dicke have been widely used.[1–4] The model described in Dicke's 1946 paper[1] has a waveguide input to a balanced crystal mixer. A lossy dielectric wheel is rotated in and out of a slot in the waveguide at 30 cps, thus modulating the signal at that frequency. The receiver has a 30 mc intermediate frequency amplifier, a diode second detector followed by a 30 cps band-pass filter, and a phase-sensitive detector to which a voltage of the modulation frequency is also applied. Final detector output is

---

* Original manuscript received by the IRE, September 17, 1954; revised manuscript received, July 13, 1955.

† Stanford University, Stanford, Calif.

[1] R. H. Dicke, "The measurement of thermal radiation at microwave frequencies," *Rev. Sci. Instr.*, vol. 17, pp. 268–275; July, 1946.

[2] R. H. Dicke and R. Beringer, "Microwave radiation from the sun and moon," *Astrophys. Jour.*, vol. 103, pp. 375–376; May, 1946.

[3] A. E. Covington, "Microwave solar noise observations," *Nature*, vol. 159, pp. 405–406; March 22, 1947.

[4] R. H. Dicke, R. Beringer, R. L. Kyhl, and A. B. Vane, "Atmospheric absorption measurements," *Phys. Rev.*, vol. 70, pp. 340–348; September, 1946.

sent through a low-pass filter, yielding a dc voltage when a signal is present. A fluctuating voltage caused primarily by receiver noise is superimposed on dc signal.

The two-receiver radiometer cross-correlates the undetected receiver outputs with a multiplying circuit followed by a low-pass filter. If superheterodyne receivers are used, the local oscillators must be synchronized. The signal is supplied to each receiver through some sort of isolating device that prevents the noise at the input of one receiver from reaching the other. This leads to the requirement of separate antennas for most applications. The receiver noises will be uncorrelated, while the signal voltages in the two receivers are highly correlated. The output of the correlator has a dc component caused by the signal and a random component due to receiver noise, just as in the Dicke circuit. The output signal-to-noise ratio in each case is defined as the quotient of the dc power and the average power of the fluctuating component.

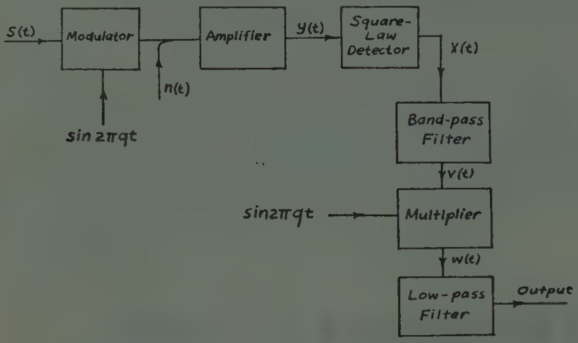


Fig. 1—Model of the Dicke radiometer.

ANALYSIS OF THE DICKE RADIOMETER

The following assumptions are made:

1. Signal, $s(t)$, and noise, $n(t)$, have independent, stationary Gaussian amplitude distributions, with zero means and average powers σ_s^2 and σ_n^2, respectively.[5]
2. Signal and noise have uniform spectral densities over the range $f_1-\alpha/2$ to $f_1+\alpha/2$ cps, and are zero elsewhere.
3. The modulator produces 100 per cent amplitude modulation of the signal at a frequency of q cps and does not affect the noise.
4. The band-pass filter has uniform response over the range $q-\beta/2$ to $q+\beta/2$ cps and zero response elsewhere.
5. The low-pass filter has uniform response from zero to γ cps, and rejects all other frequencies.
6. The amplifier is linear, having constant gain over the signal spectrum. The complication of a superheterodyne receiver is omitted.
7. The output voltage of the detector, $x(t)$, is related to the input voltage, $y(t)$, by the equation: $x(t)=ky^2(t)$.
8. The output voltage of the multiplying circuit, $w(t)$, is given by $w(t)=v(t)\sin 2\pi qt$, where $v(t)$ is the output of the band-pass filter. (Fig. 1 above.)

The input voltage to the square-law detector has the form

$$y(t) = \tfrac{1}{2}s(t)\left[1+\sin 2\pi qt\right]+n(t).$$

The output voltage is

$$x(t)=k\left\{\tfrac{1}{4}s^2(t)\left[1+\sin 2\pi qt\right]^2+s(t)n(t)\left[1+\sin 2\pi qt\right]+n^2(t)\right\}.$$

The auto-correlation function of $x(t)$ is

$$\begin{aligned}R_1(\tau)=\overline{x(t)x(t+\tau)}=k\Bigg[&\overline{s^2(t)s^2(t+\tau)}\\&\cdot\left(\frac{9}{64}+\frac{1}{8}\cos 2\pi q\tau+\frac{1}{128}\cos 4\pi q\tau\right)\\&+\overline{s(t)s(t+\tau)}\ \overline{n(t)n(t+\tau)}\ \left(1+\frac{1}{2}\cos 2\pi q\tau\right)\\&+\overline{n^2(t)n^2(t+\tau)}\ +\frac{3}{4}\ \overline{n^2(t)}\ \overline{s^2(t)}\Bigg]\cdot\end{aligned}$$

The quantities $\overline{s^2(t)s^2(t+\tau)}$ and $\overline{n^2(t)n^2(t+\tau)}$ are evaluated from a double integration over the joint bivariate normal distribution

$$\overline{s^2(t)s^2(t+\tau)} = \sigma_s^4+2\left[\overline{s(t)s(t+\tau)}\right]^2$$

$$\overline{n^2(t)n^2(t+\tau)} = \sigma_n^4+2\left[\overline{n(k)n(t+\tau)}\right]^2.$$

Auto-correlation functions $\overline{s(t)s(t+\tau)}$ and $\overline{n(t)n(t+\tau)}$ are found by taking the Fourier transforms of the assumed spectral densities of $s(t)$ and $n(t)$. Thus

$$\overline{s(t)s(t+\tau)} = \frac{\sigma_s^2\cos 2\pi f_1\tau\sin\pi\alpha\tau}{\pi\alpha\tau}$$

$$\overline{n(t)n(t+\tau)} = \frac{\sigma_n^2\cos 2\pi f_1\tau\sin\pi\alpha\tau}{\pi\alpha\tau}.$$

Substituting these relations in the expression for $R_1(T)$, and omitting periodic terms of frequencies $2q$ and $2f_1$, gives

$$\begin{aligned}R_1(\tau)=k^2\Bigg\{&\frac{\sigma_s^4}{8}\cos 2\pi q\tau+\left(\frac{9}{64}\sigma_s^4+\frac{3}{4}\sigma_s^2\sigma_n^2+\sigma_n^4\right)\\&+\left(\frac{9}{64}\sigma_s^4+\frac{1}{2}\sigma_s^2\sigma_n^2+\sigma_n^4\right)\frac{\sin^2\pi\alpha\tau}{\pi^2\alpha^2\tau^2}\\&+\frac{1}{4}\left(\frac{1}{2}\sigma_s^4+\sigma_n^2\sigma_s^2\right)\frac{\sin^2\pi\alpha\tau\cos 2\pi q\tau}{\pi^2\alpha^2\tau^2}\Bigg\}.\end{aligned}$$

The spectral density of the detector output, the inverse Fourier transform of $R_1(\tau)$, is divided into four parts, corresponding to the four terms of $R_1(\tau)$. That is

$$\begin{aligned}G_1(f) &= 4\int_0^\infty R_1(\tau)\cos 2\pi f\tau d\tau\\&= G_{11}(f)+G_{12}(f)+G_{13}(f)+G_{14}(f).\end{aligned}$$

Carrying out the integration, the components are found to be

---

[5] The units of each σ^2 is voltage squared, a one mho impedance level being understood.

$$G_{11}(f)=\frac{k^2}{8}\sigma_s^4\delta(f-q)$$

$$G_{12}(f)=k^2\left(\frac{9}{64}\sigma_s^4+\frac{3}{4}\sigma_s^2\sigma_n^2+\sigma_n^4\right)\delta(f)$$

$$G_{13}(f)=2k^2\left(\frac{9}{64}\sigma_s^4+\frac{1}{2}\sigma_s^2\sigma_n^2+\sigma_n^4\right)\frac{\alpha-f}{\alpha^2},\quad 0<f<\alpha$$

$$G_{14}(f)=\frac{k^2}{2}\left(\frac{1}{2}\sigma_s^4+\sigma_n^2\sigma_s^2\right)\frac{\alpha-q}{\alpha^2},\quad 0<f<q$$

$$=\frac{k^2}{2}\left(\frac{1}{2}\sigma_s^4+\sigma_n^2\sigma_s^2\right)\frac{\alpha-f}{\alpha^2},\quad q<f<\alpha-q$$

$$=\frac{k^2}{4}\left(\frac{1}{2}\sigma_s^4+\sigma_n^2\sigma_s^2\right)\frac{\alpha+q-f}{\alpha^2},\quad \alpha-q<f<\alpha+q.$$

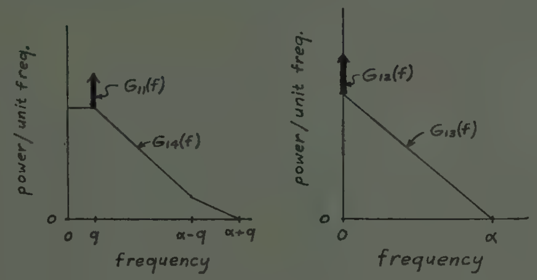


Fig. 2—Components of the spectral density of the detector output.

$G_{11}(f)$ represents the signal, while $G_{12}(f)$ represents dc that will not be transmitted by the band-pass filter (Fig. 2 above). The noise power at the output of the band-pass filter, P_2, is given by

$$P_2=\int_{q-(\beta-2)}^{q+\beta/2}[G_{13}(f)+G_{14}(f)]df.$$

Since $\alpha\gg\beta$, this can be approximated by

$$P_2=[G_{13}(q)+G_{14}(q)]\beta.$$

Substituting the expression for $G_{13}(f)$ and $G_{14}(f)$ and assuming that $\alpha\gg q$ yields

$$P_2=k^2\left[\frac{17}{32}\sigma_s^4+\frac{3}{2}\sigma_s^2\sigma_n^2+2\sigma_n^4\right]\frac{\beta}{\alpha}.$$

The spectral density of the noise changes slowly in the pass band of the filter because $\alpha\gg\beta$. Assuming that it is constant in the pass band leads to the following expression for the auto-correlation function of $v(t)$:

$$R_2(\tau)=\frac{k^2}{8}\sigma_s^4\cos 2\pi q\tau$$

$$+\frac{k^2}{\alpha}\left[\frac{17}{32}\sigma_s^4+\frac{3}{2}\sigma_s^2\sigma_n^2+2\sigma_n^4\right]\frac{\cos 2\pi q\tau\sin\beta\pi\tau}{\pi\tau}.$$

$v(t)$ can also be written

$$v(t)=[A+Bm(t)]\sin 2\pi qt$$

where $m(t)$ is a random voltage, and A and B are constants. The output of the multiplier is

$$w(t)=[A+Bm(t)]\sin^2 2\pi qt.$$

The auto-correlation function of $w(t)$ neglecting terms that are removed by the low-pass filter is

$$R_3(T)=\frac{k^2}{16}\sigma_s^4+\frac{k^2}{2\alpha}\left[\frac{17}{32}\sigma_s^4+\frac{3}{2}\sigma_s^2\sigma_n^2+2\sigma_n^4\right]\frac{\sin\pi\beta\tau}{\pi\tau}.$$

The spectral density at this point, consisting of a signal term $G_{31}(f)$ and a noise term $G_{32}(f)$ is expressed by

$$G_3=4\int_0^\infty R_3(\tau)\cos 2\pi f\tau d\tau=G_{31}(f)+G_{32}(f)$$

where

$$G_{31}(f)=\frac{k^2}{16}\sigma_s^4\delta(f)$$

and

$$G_{32}(f)=\frac{k^2}{\alpha}\left[\frac{17}{32}\sigma_s^4+\frac{3}{2}\sigma_s^2\sigma_n^2+2\sigma_n^4\right],\quad 0<f<\frac{\beta}{2}.$$

The signal power at the output of the low-pass filter is $k^2/16\sigma_s^4$, while the noise power is $G_{32}(0)\gamma$. Thus, the ratio of signal to noise is given by

$$\left(\frac{s}{n}\right)_0=\frac{\frac{1}{16}\sigma_s^4}{\frac{17}{32}\sigma_s^4+\frac{3}{2}\sigma_s^2\sigma_n^2+2\sigma_n^4}\left(\frac{\alpha}{\gamma}\right).$$

For weak signals the denominator is dominated by σ_n^4, so for this case the following simplification is made

$$\left(\frac{s}{n}\right)_0=\frac{1}{32}\frac{\sigma_s^4}{\sigma_n^4}\frac{\alpha}{\gamma}.$$

If an output signal-to-noise ratio of unity is required, the least detectable signal power in the input of a Dicke radiometer is

$$\sigma_{ld}^2=4\sqrt{2}\sigma_n^2\sqrt{\frac{\gamma}{\alpha}}.$$

The modulator wheel can be designed to cause square-wave modulation at q cps instead of the sine-wave type assumed. If this change is made and the sine-wave input to the multiplier retained, the analysis is complicated by the additional harmonics of q. But for weak signals the only significant effect of changing to a square-wave modulator is to increase the signal power by the factor $16/\pi^2$, this being the ratio of the power in the fundamental component of a square wave to that of a sine wave of the same peak amplitude. The minimum detectable signal power for the radiometer, when equipped with a square-wave modulator wheel, becomes[6]

$$\boxed{\sigma_{ld}^2=\frac{\sqrt{2}\Pi^2\sigma_n^2}{4}\sqrt{\frac{\gamma}{\alpha}}}.$$

---

[6] As pointed out by one of the reviewers, a square-wave input to the multiplier would increase the signal-to-noise ratio by the factor $\pi/\sqrt{8}$ if β is large enough to pass the harmonics of q.

ANALYSIS OF THE TWO-RECEIVER RADIOMETER[7]

The assumptions follow:

1. Signal, $s(t)$, noise in first receiver, $n_1(t)$, and noise in second receiver, $n_2(t)$, have independent, stationary, Gaussian amplitude distributions with zero means, and average powers σ_s^2, σ_{n1}^2, and σ_{n2}^2, respectively.
2. The signal and noise have flat spectral densities over the range $f_1-\alpha/2$ to $f_1+\alpha/2$ cps and are zero elsewhere.
3. The multiplier circuit obeys the equation $y(t) = kx_1(t)x_2(t)$, where $x_1(t)$ is the output of the first receiver and $x_2(t)$ that of the second.
4. The low-pass filter has uniform response from zero to γ cps, and no response elsewhere. (Fig. 3.)

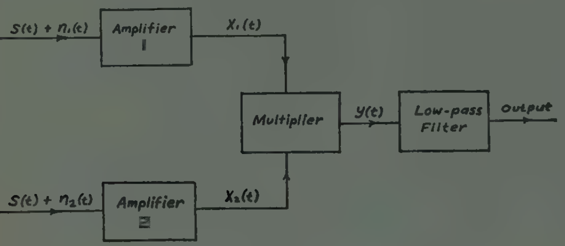


Fig. 3—Model of the two-receiver radiometer.

The voltage output of the multiplier is given by

$$y(t) = k\{s^2(t) + s(t)[n_1(t) + n_2(t)] + n_1(t)n_2(t)\}.$$

The auto-correlation function of $y(t)$ is

$$R_1(T) = k^2\{\overline{s^2(t)s^2(t+\tau)} + \overline{s(t)s(t+\tau)}\,[\overline{n_1(t)n_1(t+\tau)} + \overline{n_2(t)n_2(t+\tau)}] + \overline{n_1(t)n_1(t+\tau)}\;\overline{n_2(t)n_2(t+\tau)}\},$$

but

$$\overline{s^2(t)s^2(t+\tau)} = \sigma_s^4 + 2(\overline{s(t)s(t+\tau)})^2$$

$$\overline{s(t)s(t+\tau)} = \frac{\sigma_s^2 \cos 2\pi f_1\tau \sin \pi\alpha\tau}{\pi\alpha\tau}$$

$$\overline{n_1(t)n_1(t+\tau)} = \frac{\sigma_{n1}^2 \cos 2\pi f_1\tau \sin \pi\alpha\tau}{\pi\alpha\tau}$$

$$\overline{n_2(t)n_2(t+\tau)} = \frac{\sigma_{n2}^2 \cos 2\pi f_1\tau \sin \pi\alpha\tau}{\pi\alpha\tau}.$$

Substituting these relations, and omitting terms of frequency $2f_1$ yields

$$R_1(\tau) = k^2\left\{\sigma_s^4 + \frac{1}{2}\,[2\sigma_s^4 + \sigma_s^2(\sigma_{n1}^2 + \sigma_{n2}^2) + \sigma_{n1}^2\sigma_{n2}^2]\,\frac{\sin^2 \pi\alpha\tau}{\pi^2\alpha^2\tau^2}\right\}.$$

The first term, $R_{11}(\tau) = k^2\sigma_n^4$, describes the signal. The other term, $R_{12}(\tau)$, is noise. Noise power output of low-pass filter is approximated by $P = G_{12}(0)\gamma$, where $G_{12}(f)$ is the inverse Fourier transform of $R_{12}(\tau)$. Thus,

$$P = 4\gamma\int_0^\infty R_{12}(\tau)d\tau$$

$$= [2\sigma_s^4 + \sigma_s^2(\sigma_{n1}^2 + \sigma_{n2}^2) + \sigma_{n1}^2\sigma_{n2}^2]k^2\,\frac{\gamma}{\alpha}.$$

Since the output signal power is $k^2\sigma_s^4$, the ratio is

$$\left(\frac{s}{n}\right)_0 = \frac{\sigma_s^4}{2\sigma_s^4 + \sigma_s^2(\sigma_{n1}^2 + \sigma_{n2}^2) + \sigma_{n1}^2\sigma_{n2}^2}\left(\frac{\alpha}{\gamma}\right).$$

For the case where $\sigma_{n1}^2 = \sigma_{n2}^2 = \sigma_n^2$ and $\sigma_n^2 \gg \sigma_s^2$, the expression becomes

$$\left(\frac{s}{n}\right)_0 = \frac{\sigma_s^4}{\sigma_n^4}\,\frac{\alpha}{\gamma}.$$

A required output signal-to-noise ratio of unity results in this formula for the least-detectable signal power

$$\boxed{\sigma_{ld}^2 = \sigma_n^2\sqrt{\frac{\gamma}{\alpha}}}\,.$$

CONCLUSIONS

The minimum detectable signal power for the two-receiver radiometer is lower by a factor of 3.48. This can be attributed in part to the fact that the Dicke radiometer does not utilize the signal all of the time.

The engineering problems involved in the two devices are quite different. The two-receiver radiometer will ordinarily need a high degree of isolation between the two inputs, so that separate sources of the signal will be used. However, it is conceivable that the noise voltages in the two receivers can be made uncorrelated, if not independent. That is $n_1(t)$ and $n_2(t)$ need not be independent if their sine-wave components were always at a ninety-degree phase difference. But this situation seems difficult to obtain in practice.

Phase stability of the receivers is of great importance, since a 90-degree phase difference between them causes the signal to vanish. The multiplier or balanced modulator must be well-balanced and function over a wide bandwidth. A principal problem of radiometer circuits is that of gain-variation noise. It can be solved in the two-receiver circuit by the simple expedient of separate automatic gain controls on the receivers.

The modulator wheel of the Dicke radiometer must present a precise impedance match to the mixer, to avoid modulating the noise as well as the signal. Gain-variation noise is also eliminated by automatic gain control. The response time of the gain control must not be too short or the signal will be removed.

Although there is an appreciable difference in sensitivity between the two radiometers, the difference in input circuits will be more important in determining which should be employed for a given purpose.

ACKNOWLEDGMENT

The author wishes to acknowledge many helpful suggestions from Prof. W. Harman of Stanford University.

---

[7] A somewhat similar analysis can be found in R. M. Fano, "Signal to Noise Ratio in Correlation Detectors," *M.I.T. Res. Lab. Elec. Tech.* Rep. 186; 1951.

Correspondence

Optimizing the Design Characteristics of Triodes for Maximum Gain into a Fixed Load Impedance*

The question of optimizing the design of a triode was investigated, when operating with a small signal into an ac load impedance of a predetermined value R_L. An "ideal" triode, following the 3/2 power law, was assumed. As a further assumption, a fixed value of perveance P was assumed. In practical cases, the perveance is limited by cathode size, meaning heater wattage, and by the cathode to grid spacing, which is mostly a question of economics. Therefore, the remaining variable is the μ of the triode, which we will attempt to optimize.

With conventional terminology we write gain

$$G = g_m \frac{R_p R_L}{R_p + R_L} = \frac{\mu R_L}{R_p + R_L}.$$

To study the effect of tube variations on the gain we differentiate with respect to μ and equate to 0 for the point of maximum gain.

$$(R_p + R_L)^2 \frac{\partial G}{\partial \mu} = R_L(R_p + R_L) - \mu R_L \frac{\partial R_p}{\partial \mu} = 0.$$

Therefore

$$\mu \frac{\partial R_p}{\partial \mu} = R_p + R_L. \tag{1}$$

Now we describe the tube characteristics by:

$$I_p = P\left(E_g + \frac{E_p}{\mu}\right)^{3/2} \tag{2}$$

$$g_m = \frac{3P}{2}\left(E_g + \frac{E_p}{\mu}\right)^{1/2} \tag{3}$$

$$R_p = \frac{2\mu}{3P}\left(E_g + \frac{E_p}{\mu}\right)^{-1/2}. \tag{4}$$

We derive

$$\frac{\partial R_p}{\partial \mu} = \frac{2}{3P}\left(E_g + \frac{E_p}{\mu}\right)^{-1/2} + \frac{2\mu}{3P}(-1/2)\left(E_g + \frac{E_p}{\mu}\right)^{-3/2}\left(-\frac{E_p}{\mu^2}\right) = \frac{R_p}{\mu} + \frac{E_p}{3\mu I_p}$$

from (2) and (4). Substituting this into (1),

$$R_p + R_L = R_p + \frac{E_p}{3I_p};$$

thus

$$R_L = \frac{E_p}{3I_p} \quad \text{or} \quad I_p = \frac{E_p}{3R_L}. \tag{5}$$

This relation (5) expresses the conditions for maximum gain in terms of plate current, plate voltage and load resistance. It is interesting to note that no other parameters enter into this relation.

To evaluate μ, we introduce (2) into (5) and obtain

$$\mu_{0pt} = \frac{E_p}{\left(\dfrac{E_p}{3PR_L}\right)^{2/3} - E_g}. \tag{5a}$$

To evaluate gain we write

$$G = \frac{g_m R_L}{1 + \dfrac{R_L}{R_p}},$$

and introduce (2), (4) and (5):

$$G = \frac{g_m R_L}{1 + \dfrac{R_L I_p}{\dfrac{2}{3}\mu\left(E_g + \dfrac{E_p}{\mu}\right)}} = \frac{g_m R_L}{1 + \dfrac{E_p}{2(\mu E_g + E_p)}}$$

$$\cdot G = \frac{g_m R_L}{1 + \dfrac{1}{2\left(1 + \dfrac{\mu E_g}{E_p}\right)}}. \tag{6}$$

Since $\mu E_g/E_p$ can only vary between 0 at 0 grid bias and -1 at cutoff, it can be shown the maximum value of gain is achieved at $E_g=0$. This maximum gain is

$$G_{\max} = \tfrac{2}{3} g_m R_L.$$

It is observed that this maximum gain is identical to what would be obtained if one made a pentode of high plate resistance with the same cathode-control grid structure, if the screen grid draws $\frac{1}{3}$ the cathode current.

In practical cases it will be advantageous to make a tube with closer spacing than the "ideal" triode, allowing some island formation. It can be assumed that maximum gain then will be obtained with a somewhat lower plate current than given by the above relation. However, it remains as a useful and simple rule of thumb.

MAX BAREISS
Tung-Sol Electric Inc.
Bloomfield, N. J.

* Received by the IRE, May 2, 1955; revised manuscript received, June 22, 1955.

Influence of the Order of Overtone on the Temperature Coefficient of Frequency of AT-Type Quartz Resonators*

It is well known that the temperature coefficient of frequency of AT-type quartz resonators depends on the order of overtone. In particular the angle giving the zero temperature coefficient of frequency is different for the fundamental and overtones. For example, the zero angles measured under certain conditions for the plate[1] are, for the fundamental mode 35°10′, for the third mode 35°18′, and for the fifth mode 35°20′. In the following, a theoretical explanation for this effect is given.

The frequency equation for the nth order of the thickness shear mode of a plate[2] is expressed by

$$f_n = \frac{n}{2t}\sqrt{\frac{c_\theta{}^D}{\rho}}\left(1 - \frac{1}{n^2}\,\frac{16e_\theta{}^2}{\pi\epsilon_\theta c_\theta{}^D}\,\frac{t}{t_0}\right), \tag{1}$$

where n is the order of the mode, $c_\theta{}^D$ the resulting elastic stiffness at constant normal displacement, e_θ the resulting piezoelectric stress constant, ϵ_θ the dielectric constant, t the thickness of the plate, $t_0=t+\epsilon_\theta\Delta$ with Δ being the total electrode gap, and ρ the density. The subscript θ indicates the angle of orientation of the plate. For the temperature coefficient of frequency, considering only the terms of first order from (1), it follows that

$$Tf_n = \tfrac{1}{2}Tc_\theta{}^D + (\alpha_x - \alpha_z)\sin^2\theta + \tfrac{1}{2}\alpha_z - [2Te_\theta - Tc_\theta{}^D - T\epsilon_\theta]\,\frac{16e_\theta{}^2}{n^2\pi\epsilon_\theta c_\theta{}^D}\,\frac{t}{t_0}, \tag{2}$$

where α_x and α_z are the linear coefficients of expansion perpendicular and parallel to the axis. The last term in (2) becomes zero for infinitely large electrode gap $\Delta \to \infty$ ($t_0 \to \infty$) or for very high order of n. The difference between the temperature coefficient of frequency for the fundamental mode ($n=1$) and the mode of the order n assuming a zero electrode gap ($t_0=t$) is, according to (2),

$$Tf_n - Tf_1 = [2Te_\theta - Tc_\theta{}^D - T\epsilon_\theta] \cdot \frac{16e_\theta{}^2}{\pi\epsilon_\theta c_\theta{}^D}\left(1 - \frac{1}{n^2}\right). \tag{3}$$

As an example the AT-type quartz resonator may be considered. The values for $\theta=35°10'$ are

$c_\theta{}^D = 29.26 \cdot 10^{10}$ dyn·cm^{-2} $\quad Tc_\theta = -6 \cdot 10^{-6}/°\mathrm{C}$
$e_\theta = 2.88 \cdot 10^4$ ESU·cm^{-2} $\quad Te_\theta = 1.0 \cdot 10^{-4}/°\mathrm{C}$
$\epsilon_\theta = 4.53$ $\quad T\epsilon_\theta = 0.$[3]

Accurate values for $T\epsilon$ are not yet known; however, the temperature change of ϵ in the temperature range considered is very small (see ref. 3). Using these values, the difference between the temperature coefficient of frequency for the fundamental mode Tf_1 and the mode of infinitely high order Tf_∞, assuming zero electrode gap, is

$$Tf_\infty - Tf_1 = [2Te_\theta - Tc_\theta{}^D - T\epsilon_\theta]\,\frac{16e_\theta{}^2}{\pi\epsilon_\theta c_\theta{}^D} = 0.66 \cdot 10^{-6}/°\mathrm{C}. \tag{4}$$

* Received by the IRE, August 8, 1955.

---

[1] R. Bechmann, "Frequency-Temperature Behavior of Resonators of Natural and Synthetic Quartz," paper presented at the Ninth Annual Frequency Control Symposium of the U. S. Signal Corps, Components Division, Frequency Control Branch, Fort Monmouth, N. J.; May 26, 1955.

[2] R. Beckmann, "Thickness vibrations of piezoelectric crystal plates," *Arch. elekt. Übertragung*, vol. 6, pp. 361–368; 1952.

[3] A. Pavlovic, and R. Pepinsky, "Re-examination of low-temperature properties of crystalline quartz," *Jour. Appl. Phys.*, vol. 25, pp. 1344–1345; October, 1954.

Using the value $-5.15\cdot 10^{-6}/°C$ for the change of the first-order temperature coefficient of frequency[1] with the angle of orientation θ, the zero angle of the temperature coefficient of frequency for the mode of infinitely high order is shifted about 7.7′ in arc in comparison with the fundamental mode—for the third mode the shift is about 6.8′. These values for the differences of the zero angles for the temperature coefficients of frequency are in good agreement with the experimental values given above. The calculated differences in the angles are somewhat smaller than the observed values. However, small uncertainties in these values are involved due to the omission of the unknown temperature coefficient of the dielectric constant $T_{\epsilon\theta}$.

Similarly, the properties of BT-type quartz resonators and of thickness shear mode resonators made from other materials having zero temperature coefficients of frequency, for example EDT and DKT, can be calculated.

R. Bechmann
Brush Labs. Co., Div. Clevite Corp.
Cleveland, Ohio

Optimum Tube Utilization in Cascaded Distributed Amplifiers*

In the paper "Distributed Amplification"[1] a derivation is given for the minimum number of tubes required to produce a given gain, showing that a minimum of tubes is obtained when the individual stage gain is $e(=2.718)$. The derivation ignores the fact that in the usual practical situation both a gain and 3-db bandwidth are specified. This requires the evaluation of a bandwidth-narrowing factor which is introduced when stages are cascaded. This factor which depends on the type of transmission line and its design parameters will be evaluated for a design using constant-resistance bridged-T-lines (i.e., $Z_{0p}=Z_{0g}=R$).

The single-stage transfer function in this case is given by

$$\frac{|e_0|}{|e_{in}|}=\frac{ng_mR}{2[(1-x^2)^2+m^2x^2]},\tag{1}$$

where

x = normalized frequency (f/f_c),
n = number of tubes per stage,
$m^2=L/(L-4M)$,
g_m = tube transconductance,
L = inductance of center-tapped coil, and
f_c = line cutoff frequency.

Eq. (1) is essentially equivalent to that derived in the referenced article.[2] The time delay per stage (τ) is a function of frequency given by

$$\tau=\frac{nm(1+x^2)}{\pi f_c[(1-x^2)^2+m^2x^2]}.\tag{2}$$

Inspection of (1) shows that the steady-state frequency response is maximally flat for $m=\sqrt{2}$ and inspection of (2) shows that the time-delay vs frequency characteristic is maximally flat for $m=\sqrt{3}$. In the design of a pulse amplifier the steady-state amplitude response and the time-delay (or phase) response vs frequency can be considered of equal importance. This suggests using a compromise value for m, between the $\sqrt{2}$ and $\sqrt{3}$, in a practical design.

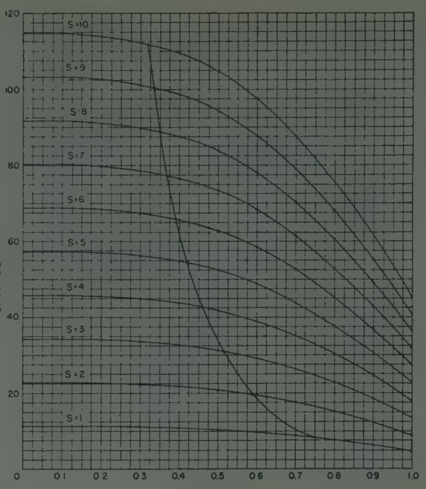


Fig. 1—Cascaded amplifier gain vs normalized frequency.

Fig. 1 is a graph of gain[3] vs normalized frequency as successive stages are cascaded with $m=1.5$. The 3-db points on each characteristic are shown connected by a smooth curve. In Fig. 2 these points have been replotted to show the cascaded resultant bandwidth (B) as a function of the number of cascaded stages (S). Fig. 3 is the same plot on a log/log scale. The points can now be connected by a straight line with reasonable accuracy and the empirical relation

$$B=0.75f_cS^{-0.365}\tag{3}$$

can be derived from Fig. 3.

With (3) now available the development is similar to that of the above mentioned paper:

$$N\text{ (total tube complement)}=nS.\tag{4}$$

Before (4) can be differentiated, an additional relationship is needed between n and S. From (1), the zero frequency cascaded gain G is

$$G=\left[\frac{ng_mR}{2}\right]^s.\tag{5}$$

For both constant-resistance bridged-T lines and m-derived lines,[4]

$$R=\frac{m}{\pi f_cC}=\frac{1.5}{\pi f_cC},\tag{6}$$

where C is kept to the minimum value dictated by the tube input capacity plus the stray wiring capacity. Substituting f_c from (3) in (6) and then substituting resultant expression for R in (5) and solving for n:

$$n=\frac{8\pi BCG^{1/s}S^{0.365}}{4.5g_m}.\tag{7}$$

Eq. (7) is the additional relationship required. The parameters G and B are the specified gain and over-all bandwidth, and C and g_m are determined by the tube selected. The variables left to our control are the number of stages and the number of tubes per stage. Under the assumptions

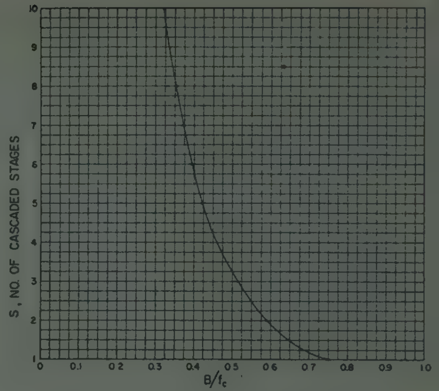


Fig. 2—Number of cascaded stages vs. normalized bandwidth.

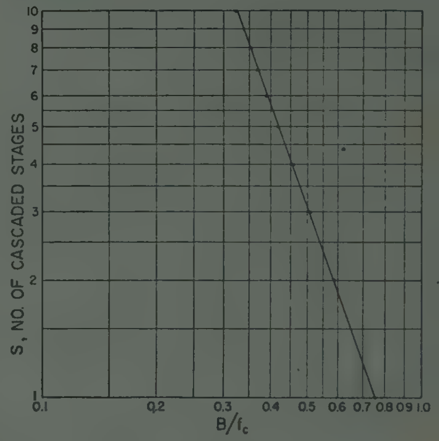


Fig. 3—Number of cascaded stages vs normalized bandwidth (log/log scale).

$G=10^4$ $B=50$ mc
$g_m=5000$ umhos $C=7$ uuf

we have

$$n=0.391(G)^{1/s}S^{0.365}\tag{8}$$

and

$$N=0.391(G)^{1/s}S^{1.365}.\tag{9}$$

Finding dN/dS from (9) and letting the derivative equal zero:

$$1.365S-\ln G=0,\tag{10}$$

and for $G=10^4$:

$S=6.75$ stages
$N=20.6$ tubes
$n=3.14$ tubes/stage
stage gain = 11.85 db (voltage gain of 3.92).

The best approximation to these figures for a practical amplifier would be seven stages of three tubes each.

The line cutoff frequency (f_c) can be calculated from (3) and the line impedance from (6) with the results.

$$f_c=136\text{ mc}$$
$$R=500\text{ ohms.}$$

Fig. 4 is a photograph of a distributed amplifier with design parameters reasonably close to the above. The tube comple-

---

* Received by the IRE, August 3, 1955.

[1] E. L. Ginzton, W. R. Hewlett, J. H. Jasberg and J. D. Noe, Proc. IRE, vol. 36, pp. 956–969; August 1948.

[2] Loc. cit., p. 969, eq. (71).

[3] The gain scale (db) is actually arbitrary, the numbers shown were inserted after the final design was determined.

[4] Note similarity to reference 2, eqs. (11) and (20).

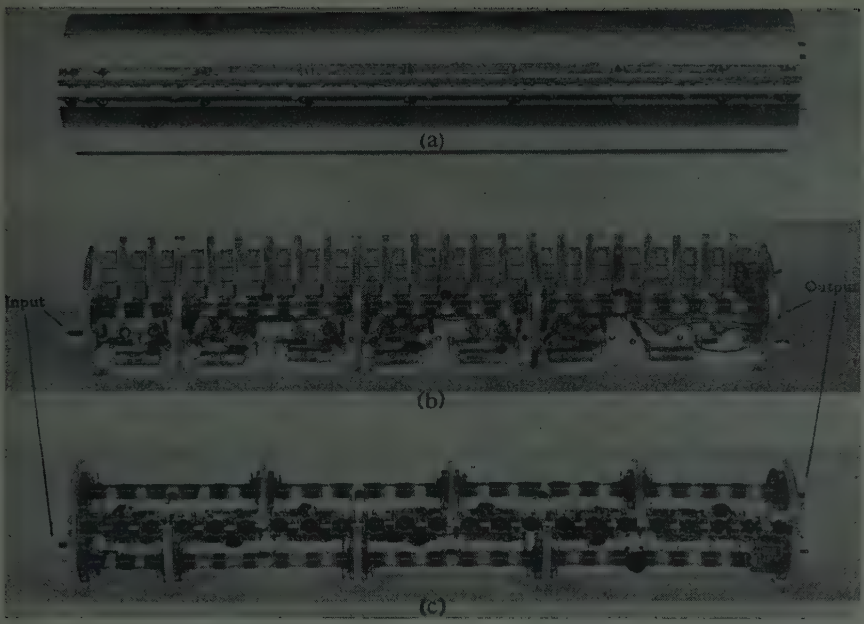


Fig. 4—80-db distributed amplifier. (a) amplifier enclosed in cylindrical jacket. (b) side view, jacket removed. (c) Top view, jacket removed.

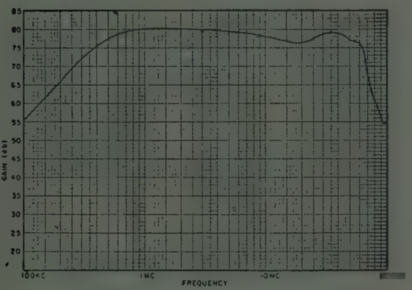


Fig. 5—Distributed amplifier frequency response.

ment is twenty-three 5840's, there being 5 tubes in the seventh (output) stage to obtain a greater output voltage swing than is available from the 3 tube stages. Fig. 5 shows the amplifier gain in db as a function of frequency for a total $B+$ current of 230 ma. The upper 3-db cutoff is at 55 mc.

A. I. Talkin
J. V. Cuneo
Diamond Ordnance Fuze Lab.
Washington 25, D. C.

Self-Bias Cutoff Effect in Power Transistors*

In a recent article[1] the author pointed out that the majority carrier current flowing through the base region of a transistor towards the base connection causes an ohmic voltage drop which is in such a direction as to reduce the forward bias on parts of the emitter distant from the base lead. In power transistors this effect is serious and substantially all the emitter current is carried by a small area of the emitter near to the base contact. In that article an expression was derived for this effect at moderate current densities, which, when the emitter efficiency term is included, can be written, for a p-n-p transistor,

$$i(x) \approx j(0)\left[1 + x\sqrt{\frac{1}{2W\sigma_b}\left(\frac{\sigma_b W}{\sigma_e L_e} + \frac{1}{2}\frac{W^2}{L_b^2}\right)\frac{q}{kT}j(0)}\,\right]^{-2}, \qquad (1)$$

where $j(x)$ is the emitter current density at a distance x from the base connection (see Fig. 1), W is the base width, σ_e the conductivity, L_e the diffusion length of minority carriers in the emitter region, and σ_b the conductivity of the base region.

It has been pointed out to me by Mr. N. Golden of Transistor Products and Dr. R. N. Hall of the General Electric Company that the case of most practical interest occurs at injection levels much higher than those discussed. A more general solution for the high level case is presented below.

Webster[2] has derived an expression for α as a function of emitter current. If we omit surface terms and consider the semi-infinite transistor in Fig. 1, then for the p-n-p case,

$$1-\bar{\alpha}(x) \approx \left[\frac{\sigma_b W}{\sigma_e L_e} + \frac{1}{2}\frac{W^2}{L_b^2}\right]\left[1 + \frac{z}{2}\right], \qquad (2)$$

where

$$z = \frac{W\mu_e}{D_p\sigma_b}j(x), \qquad \bar{\alpha} = \frac{1}{j}\int_0^j \alpha\, dj. \qquad (3)$$

If $\bar{\sigma}_b(x)$ is the average base conductivity "seen" by the base current at x, then

$$\bar{\sigma}_b(x) = h\sigma_b\left(1 + \frac{z}{2}\right), \qquad (4)$$

where h is a weighting factor, approximately equal to ½ for high currents.

If $i_b(x)$ is the base current at x, then

$$\frac{di_b}{dx} = -(1-\bar{\alpha})j(x), \qquad (5)$$

and if $V(x)$ is the forward bias voltage of the emitter relative to the base at x,

$$i_b(x) = -W\bar{\sigma}_b\frac{dV}{dx} - \frac{kT}{q}\frac{d\sigma_b}{dx}W, \qquad (6)$$

where the second term on the right takes account of the flow of electrons through the base by diffusion.

These two equations are now treated by the method of reference 1, but taking into account the dependence of $\bar{\sigma}_b$ on x given by (4). We also assume that we can write

$$j(x) = j_0 e^{qv/kT}, \qquad (7)$$

where j_0 is a constant. The equations can now be solved but the result is a complicated implicit expression for $j(x)$. To obtain an explicit expression we assume

$$z = \frac{W\mu_e}{D_p\sigma_b}j(x) \gg 1 \qquad (8)$$

for all x less than the value in which we are interested. This restricts our discussion to values of $j(x)$ greater than about 20 amperes per square centimeter in typical cases. Essentially, (8) implies that the conductivity of the base region is due principally to the electrons accompanying the injected holes, rather than to the original base material conductivity.

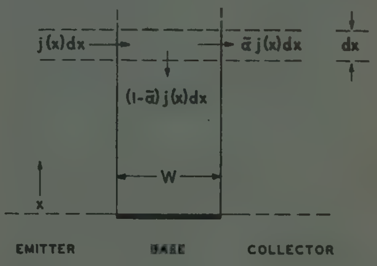


Fig. 1

With this restriction we find

$$j(x) \approx j(0)\left[1 + x\sqrt{\frac{1}{6W\sigma_b}\left(\frac{\sigma_b W}{\sigma_e L_e} + \frac{1}{2}\frac{W^2}{L_b^2}\right)\frac{q}{kT}j(0)}\,\right]^{-2}, \qquad (9)$$

which then gives the fall-off of emitter current density with distance from the base connection (or the edge of the emitter in more complicated geometries). Eq. (9) differs from low level case only by factor $\sqrt{1/3}$ in coefficient x. Of this factor $1/\sqrt{2}$ is due to inclusion of diffusion term[3]; $\sqrt{2/3}$ to modulation of the base conductivity.

I should like to express my thanks to Dr. Hall and Mr. Golden for their interest and for many helpful suggestions.

N. H. Fletcher
Transistor Products, Inc.
Waltham, Massachusetts
(On leave from Div. of Radiophysics,
C.S.I.R.O., Sydney, Australia)

---

* Received by the IRE, August 2, 1955.

[1] N. H. Fletcher, "Some aspects of the design of power transistors," Proc. IRE, vol. 43, pp. 551–559; May, 1955.

[2] W. M. Webster, "On the variation of junction transistor current amplification factor with emitter current," Proc. IRE, vol. 42, pp. 914–920; June, 1954.

[3] R. N. Hall has treated the effects of diffusion and independently arrived at this same result. (Private communication.)

A Note on the Transfer Voltage Ratio of Resistive Networks with Positive Elements*

In a recent note[1] Reza and Lewis state the transfer voltage theorem,[1] "The magnitude of the voltage transfer ratio $A(s)$ of a passive RLC network containing no transformers is not greater than one for positive real values of s."

Their proof is based on the fact that the voltage transfer ratio for a purely resistive network (without ideal transformers) cannot exceed unity. A discussion at the Symposium on Circuit Analysis held at the University of Illinois in May, 1955 indicated that a simple proof of this (intuitively obvious) fact is not generally known. Such a proof is therefore given below.

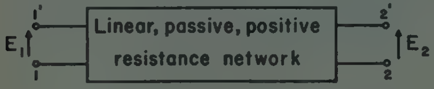


Fig. 1—Notation used (following Reza and Lewis).

Assume that a voltage $E_1 = V_1' - V_1$ is applied to the input terminals $1'-1$ of the network (Fig. 1). V_k denotes the potential of node k with respect to some reference point. For convenience, terminals $1'$ and $2'$ are taken to have potentials higher than (or equal to) terminals 1 and 2, respectively. Suppose that some node n different from node $1'$ has the maximum potential $V_{\max}$ of the network. Then all currents flowing through branches connecting n and its neighboring nodes are directed away from node n if all resistances are positive. In view of Kirchhoff's node current law, all these currents must be zero, and thus the potentials of all nodes connected to n must equal $V_{\max}$. The argument may be repeated for any one of the nodes, say node m, connected to n, then for any one of the nodes connected to m, and so forth until node $1'$ appears connected to one of the nodes at potential $V_{\max}$. Hence $V_{\max}$ must equal V_1', and the potential of no node of the network, including the output node $2'$, can exceed V_1'. Similarly, by considering a node k with the lowest potential $V_{\min}$, it is seen that no node, including node 2, can have a potential lower than that of node 1. Thus the output voltage magnitude $|E_2| = |V_2' - V_2|$ cannot exceed the input voltage magnitude $|E_1| = |V_1' - V_1|$, and the voltage transfer ratio E_2/E_1 cannot exceed unity.

The proof given makes use of the fact that all elements are positive. The theorem is clearly not true, for example, for the passive network with negative elements shown in Fig. 2.[2]

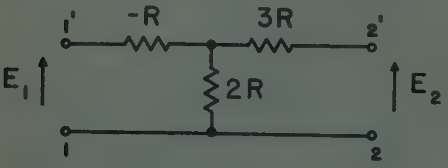


Fig. 2—A passive network for which the voltage transfer ratio exceeds unity.

The proof of Corollary I given by Reza and Lewis begins with, and rests on, the statement, "Since, for s real and positive, all elements act as resistors, then if $|E_1| = |E_2|$, terminals 2 and $2'$ must coincide with 1 and $1'$; that is, there must be zero resistance paths through the network between corresponding terminals." This statement may be proved as follows, except for the special Case II noted.

Case I—Finite Resistance between terminals 2 and $2'$ (Fig. 3). In this case ($E_2 \neq 0$), current flows from node $2'$ toward node 2. Hence, current must flow toward node $2'$ from at least one other node, say node 3. If $|E_2| = |E_1|$, then $V_2' = V_1'$ cannot be exceeded by any other node potential as shown above. Hence $V_3 = V_2'$ and the resistance between nodes 3 and $2'$ must be zero. By repeating this argument, it is seen that a zero resistance path must link nodes $2'$ and $1'$. Similarly, a zero resistance path must exist between nodes 2 and 1.

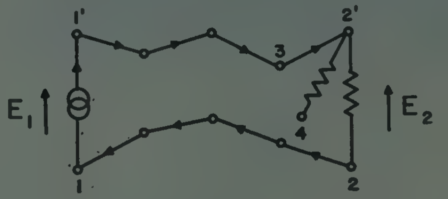


Fig. 3—Conditions existing when $|E_1| = |E_2|$, finite resistance between 2 and $2'$.

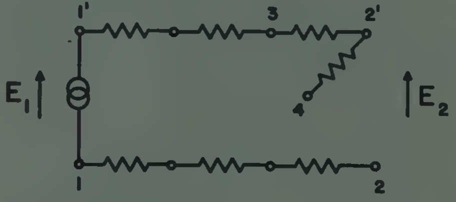


Fig. 4—Conditions existing when $|E_1| = |E_2|$, infinite resistance between 2 and $2'$.

Case II—Infinite resistance between terminals 2 and $2'$ (Fig. 4).[3] In this open circuit case no current can flow from node $2'$ toward node 2, and hence no current can flow toward node $2'$; hence the output and input nodes may be linked by resistance paths which carry no current.

R. J. Schwarz
Dep't. of Elec. Engrg.
Columbia University
New York 27, N.Y.

---

* Received by the IRE, July 22, 1955.

[1] F. M. Reza and P. M. Lewis II, "A note on the transfer voltage ratio of passive RLC networks," Proc. IRE, vol. 42, p. 1452; September, 1954.

[2] A passive network is defined as one whose total energy input is non-negative.

[3] This special case was pointed out by Dr. S. Darington.

Two Problems in Geometrical Optics and Application of the Results in Electron Trajectory Calculations*

Sometime back the author came across the two following two-dimensional problems:

1. Given a number of refracting media with circular cylindrical symmetry, that is, refracting surfaces disposed coaxially and the index of refraction a function of only the radius r (see Fig. 1), what can we say about the angles of incidence and/or refraction in the media for any given initial angle of incidence?

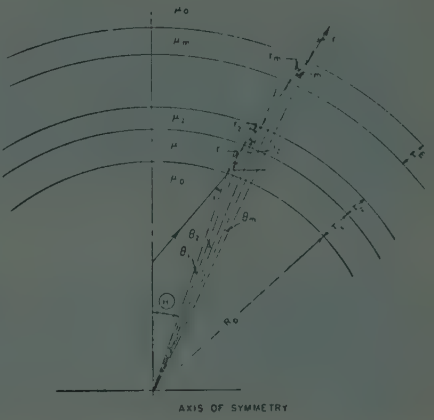


Fig. 1—Disposition of refracting surfaces (circular symmetry).

2. Given a number of refracting media whose disposition is as shown in Fig. 2,

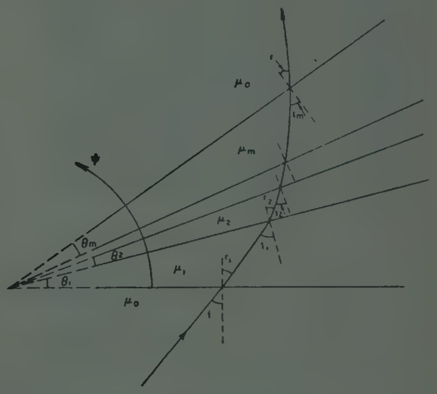


Fig. 2—Disposition of refracting surfaces (index of refraction function of polar angle ψ only).

where the refractive index is a function of only the polar angle ψ, what can we conclude about the angles of incidence and/or refraction in the media for any given initial angle of incidence?

As these problems are not treated in existing books[1] on geometrical and/or electron optics and since the solutions of the above problems are applicable to some interesting and practical problems, it was thought desirable to treat them here.

1. Let there be m media of refractive indices $\mu_1, \mu_2 \cdots, \mu_m$ (see Fig. 1). Let the initial angle of incidence and the final angle of refraction be denoted by i and r respectively. (For notation regarding other angles, see Fig. 1.) Let τ_j be the radial thickness of the jth medium. Then by the application of Snell's law and elementary trignometry, we have

---

* Received by the IRE, August 3, 1955. Work carried out while the author was associated with the Electronics Lab., General Electric Co., Syracuse, N. Y.

[1] M. Born, "Optik," Springer, Berlin; 1933. J. L. Synge "Geometrical Optics," Cambridge University Math. Tract., 1937; W. Glaser, "Grundlagen der Elektronenoptik," Springer-Verlag, Wien; 1952.

$$\frac{\sin i}{\sin r_1} = \mu_1/\mu_0$$
$$\frac{\sin i_1}{\sin r_2} = \mu_2/\mu_1 \qquad (1)$$
$$\vdots$$
$$\frac{\sin i_m}{\sin r} = \mu_0/\mu_m,$$

and

$$\underline{/r_j} = \underline{/i_j} + \theta_j; \qquad j = 1, 2, \cdots m. \qquad (2)$$

Before we proceed with the case of an arbitrary value for m, consider first of all the case $m=1$. By the application of (1) and (2) we have

$$\frac{\sin i}{\sin r_1} \cdot \frac{\sin i_1}{\sin r} = 1,$$

and from trigonometry

$$\frac{R_0 + \tau_1}{\sin r_1} = \frac{R_0}{\sin i_1}.$$

Hence, the simple desired result[2]

$$\sin i = (1 + \tau_{1/R_0}) \sin r. \qquad (3)$$

Next, letting $m=2$, by a similar procedure as indicated above we obtain

$$\frac{\sin i}{\sin r} = (1 + \tau_{1/R_0})(1 + \tau_{2/R_0+\tau_1}). \qquad (4)$$

Finally, we can proceed to write the expressions for any general value of m, and these are

$$\frac{\sin i}{\sin r} = \prod_{k=1}^{m} \left\{ 1 + \frac{\tau_k}{R_0 + \sum_{j=1}^{k-1} \tau_{k-j}} \right\}, \qquad (5)$$

and

$$\frac{\sin i}{\sin i_m} = \frac{\mu_m}{\mu_0} \prod_{k=1}^{m} \left\{ 1 + \frac{\tau_k}{R_0 + \sum_{j=1}^{k-1} \tau_{k-j}} \right\}. \qquad (6)$$

Writing $\tau_{j/R_0} = \epsilon_j$, we can simplify (5) and (6) as follows.[3]

$$\frac{\sin i}{\sin r} = \prod_{k=1}^{m} \left\{ 1 + \frac{\epsilon_k}{1 + \sum_{j=1}^{k-1} \epsilon_{k-j}} \right\}$$
$$= \left\{ (1 + \epsilon_1) \frac{1 + \epsilon_1 + \epsilon_2)}{1 + \epsilon_1} \cdots \right.$$
$$\left. \cdot \frac{(1 + \epsilon_1 + \epsilon_2 \cdots + \epsilon_m)}{(1 + \epsilon_1 + \cdots + \epsilon_{m-1})} \right\}$$

i.e.,

$$\frac{\sin i}{\sin r} = \left(1 + \sum_{j=1}^{m} \epsilon_j \right) = (1 + \epsilon), \qquad (7)$$

and

$$\frac{\sin i}{\sin i_m} = \frac{\mu_m}{\mu_0} (1 + \epsilon), \qquad (8)$$

where

$$\epsilon = \sum_{j=1}^{m} \epsilon_j.$$

We can write similar expressions for $\theta_1, \theta_2, \cdots, \theta_m$. Recall that in geometrical optics when we say a medium has a refractive index $\mu > 1$ we mean light travels slower in that medium than in free space; in electron optics, electron travels faster in a medium of higher refractive index.

The above solution has been successfully used by the author in calculation of electron trajectories in region between mask and screen of a color television tube (see Fig. 3) where mask was replaced by conducting membrane permeable to electrons.

2. Again assume that we have m media (for details of notation regarding angles, see Fig. 2). By a repeated application of Snell's law and employing elementary trigonometry, we obtain the following relations analogous to (6) and (7).

$$\frac{\sin i}{\sin r} = \frac{\prod_{j=1}^{m} \sin r_j}{\prod_{j=1}^{m} \sin (r_j + \theta_j)} \qquad (9)$$

and,

$$\frac{\sin i}{\sin i_m} = \frac{\mu_m}{\mu_0} \frac{\prod_{j=1}^{m} (\sin r_j)}{\prod_{j=1}^{m} \sin (r_j + \theta_j)}. \qquad (10)$$

Eqs. (9) and (10) are useful for a step by step calculation. [It does not appear possible to write (9) and (10) in simpler forms unless some drastic assumptions are made.]

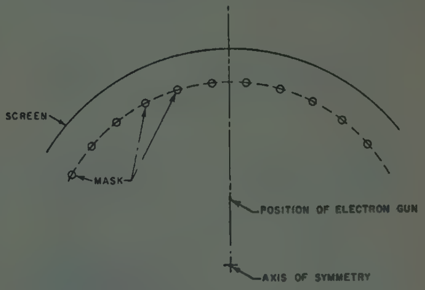


Fig. 3—Disposition of mask and screen in a color television tube.

The above relations can be employed for the calculation of electron trajectories in the region between two conducting plates at different potentials inclined at an angle. Such structures occur in present day cathode ray tubes. Other applications to the above results can be easily thought of.

S. V. Yadavalli
General Electric Microwave Lab. at Stanford
Palo Alto, Calif.

* * *

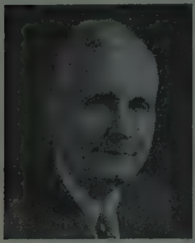
---

[2] We note that if we have parallel plane symmetry a relation analogous to (3) would be of the form $\sin i = \sin r$.

[3] This simplification was brought to the attention of the author by Dr. H. Ahlburg of The Electronics Laboratory, General Electric Co., Syracuse, N. Y.

Contributors

J. M. Barstow received the B.S. degree in physics from Washburn University in 1923, and the M.S. degree in physics from the University of Kansas in 1924.


J. M. Barstow

He was associated with the Southwestern Bell Telephone Co. until 1926, when he joined the Bell System. In 1927, he was a member of the ATNT development and research department. He was concerned in his early work with the develment of circuit noise and room noise meters, and standards for room noise measurements. He also studied coordination problems for a joint project with Edison Electrical Institute.

During World War II, he was engaged in several military projects here and abroad. Since then, he has worked on the development of power-line carrier telephone systems and various problems associated with television and long-distance telephone transmission.

Mr. Barstow is Vice-Chairman of Panel 17 of the National Television System Commission and has participated in studies and tests which have led to the formulation of NTSC color-signal specifications. He is a member of Sigma Xi, the American Institute of Electrical Engineers, the Statistical Society of America, and the Society of Motion Picture and Television Engineers.

◆

A. D. Berk was born on April 28, 1925, in Istanbul, Turkey, where he received the B.S. degree in E.E. from Robert College in 1947. He continued his studies here in America at the Rensselaer Polytechnic Institute and served as an instructor in the department of electrical engineering of the same institution. After receiving the M.S. degree from R.P.I. in 1951, he resumed his studies at M. I. T. while serving as a research assistant at the Research Laboratory of Electronics. He received the degree of Doctor of Science from M.I.T. in September, 1954.

A. D. Berk

Dr. Berk specializes in problems of electromagnetic theory. Since 1954 he has been a member of the technical staff of the Research Laboratories, Hughes Aircraft Company, Culver City, California. He is a member of Sigma Xi.

◆

C. E. Blakely was born October 25, 1927 in Trenton, Tenn. After serving three years in the Marine Corps as an electronics technician, he entered the University of Tennessee and received the B.S.E.E. degree in 1953.

C. E. Blakely

Since 1953 he has been a research assistant at the University of Tennessee, engaged primarily in electronics and electromagnetic radiation research. At the same time, he studied for his M.S., receiving this degree from this university in 1955.

Mr. Blakely, in addition to being a member of the IRE, is a member of Tau Beta Pi, Eta Kappa Nu, and Phi Kappa Phi.

◆

For a biography and photograph of M. R. Currie, see page 1533 of the October, 1955 issue of Proceedings of the IRE.

◆

L. O. Dolanský (SM'53) was born in Vienna, Austria, on May 6, 1919. He received the Ing. degree in electrical engineering from the Institute of Technology in Prague, Czechoslovakia in 1946, and the M.S. and E.E. degrees in electrical communications from the Massachusetts Institute of Technology in 1949 and 1952, respectively.

L. O. Dolanský

From 1942 to 1945, he worked with Radiotechna, a.s., a subsidiary of Siemens and Halske in Přelouč, Czechoslovakia. In 1945, he joined the teaching staff of the Institute of Technology in Prague, Czechoslovakia. He was associated with the Research Laboratory of Electronics at M.I.T., working on research problems in magnetic tape recording, pulse code modulation, frequency modulation, and television, from 1947 to 1952.

Since 1952 he has been working with the Electronics Research Project at Northeastern University on problems related to visual message presentation, speech analysis, and speech compression. At present, he is associate professor of research in communications at Northeastern. He has been teaching various undergraduate and graduate subjects in electrical engineering during the last three years.

Mr. Dolanský is a member of Tau Beta Pi, Sigma Xi, the American Society for Engineering Education, and the Massachusetts Society of Professional Engineers.

◆

E. E. Eldredge received the B.S. degree in electrical engineering from Brown University in 1927. He has had experience in all phases of radio communications, including antenna development, transmitter design, marine equipment, and instrumentation and pulse techniques.

E. E. Eldredge

He was chief engineer of Press Wireless Manufacturing Co. and Erco Radio Laboratory. Later, he became an engineering specialist in the systems engineering and techniques section of the Physics Laboratories of Sylvania Electric Products, Inc. at Bayside, N. Y.

Mr. Eldredge is presently manager of the equipment fabrication branch of Sylvania's Electronic Defense Laboratory at Mountain View, Calif.

◆

S. J. Goldstein, Jr. was born on June 23, 1925, in Indianapolis, Ind. He served as a radio technician in the Signal Corps from 1943 to 1946.

S. J. Goldstein, Jr.

In 1948, he received the B.S. in E.E. degree from Purdue University. He was employed by the Glenn L. Martin Co. for one year, and from 1949 to 1951 was associated with the Industrial Development Engineering Associates of Indianapolis.

From 1951 to 1953, Mr. Goldstein worked in the Jet Propulsion Laboratory of the California Institute of Technology. He received the M.S. degree from Stanford University in June, 1954, and is continuing graduate studies at Harvard College Observatory.

Mr. Goldstein is a member of Eta Kappa Nu, Tau Beta Pi, and Sigma Xi.

◆

H. Greenberg (A'52) was born on January 3, 1928, in New York, N. Y. He received the B.A. degree in physics from Brooklyn College in 1949. During 1950, he was a graduate assistant in the mathematics department of the University of Miami.

H. Greenberg

In 1949, Mr. Greenberg was a physicist with the Navy Department, where he was engaged in research on underwater sound. Since 1951, he has been with Sylvania Electric Products, Inc. in Bayside, N. Y. He has been concerned primarily with the analysis of weapons systems and in research on traveling wave tubes.

Mr. Greenberg is a member of Pi Mu Epsilon, RESA, and the Operations Research Society of America.

❖

C. C. Hsu was born in Shanghai, China, on June 30, 1923. He received the B.S.E.E. degree from the Chiao-Tung University, Shanghai, in June, 1945. After coming to the United States in 1948, he was awarded the M.S. degree in engineering by the University of Michigan in 1949, and the Ph.D. degree in electrical engineering from Ohio State University in 1951.

C. C. Hsu

From 1945 to 1947, he worked as a junior engineer in China. From 1950 to 1951, he was appointed as a graduate assistant in the department of electrical engineering of Ohio State, and was an assistant professor in electrical engineering at the Michigan College of Mining and Technology, Houghton, Mich., in 1952. At present, he is employed by the Bendix Radio Division, Baltimore, Md.

Dr. Hsu is an associate member of Sigma Xi, and a member of Pi Mu Epsilon.

❖

D. B. Jordan (A'45) was born in Aberdeen, N.C. on June 9, 1923. He received the B.A. degree from Hofstra College in 1949, and the M.S. degree in applied mathematics from the Polytechnic Institute of Brooklyn in 1952.

D. B. Jordan

From 1949 to 1951, Mr. Jordan held a teaching fellowship at the Polytechnic Institute of Brooklyn. From 1951 to 1955, he was employed in the Physics Laboratories of the Sylvania Electric Products, Inc., where he worked on the theoretical analysis of communication systems. He also worked in the Missile Systems Laboratory on the design of analog and digital data reduction systems. In April, 1955, he joined the Guided Missile Division of Republic Aviation Corp. as senior systems engineer.

Mr. Jordan is a member of RESA, Kappa Mu Episilon, and Sigma Pi Sigma.

❖

B. A. Lengyel was born on October 5, 1910, in Budapest, Hungary. He attended the Polytechnic Institute and received the Ph.D. degree from Pázmány University of Budapest in 1935. In the fall of 1935, he came to the United States as a research fellow in mathematics at Harvard University.

Dr. Lengyel taught mathematics at the Polytechnic Institute in Budapest from 1931 to 1934, and at Rensselaer Polytechnic Institute from 1939 to 1942. After one year in the physics department of the College of the City of New York in 1943, he became an assistant professor of physics at the University of Rochester.

From 1946 to 1950 he was a staff member of the Naval Research Laboratory where he specialized in research in microwaves. After two years of service in the Office of Naval Research as a staff physicist he joined the research laboratories of the Hughes Aircraft Company in 1952. He is now the head of the Research Section of the Microwave Electronics Department.

Dr. Lengyel is a member of the American Mathematical Society, the Physical Society, and Sigma Xi.

❖

D. J. LeVine (S'43–A'44–M'49) was born in New York, N. Y., on October 10, 1921, He received the B.E.E. degree from the School of Technology, College of the City of New York in 1943, and the M.E.E. degree in 1952 from the Polytechnic Institute of Brooklyn.

D. J. LeVine

From 1943 to 1946, he served in the Signal Corps working with radar and PTM microwave relay communications equipment in the United States and Europe. From 1946 to 1948, he was with the Microwave Research Institute, Polytechnic Institute of Brooklyn, working primarily on microwave power measuring devices. Mr. LeVine joined the Federal Telecommunication Laboratories, Inc. in 1948, and at present he is working on microwave antennas, switching devices, and associated microwave components.

Mr. LeVine is an executive engineer in the Radio Communication Laboratory. He is an associate of the American Institute of Electrical Engineers.

❖

For a photograph and biography of J. G. Linvill, see page 882 of the July, 1955 issue of the Proceedings of the IRE.

❖

R. H. Mattson was born in Chisholm. Minn., in 1900. He served with the U. S, Navy from 1946 to 1947, and after completing the Navy electronics course, worked on airborne electronic equipment.

He received the B.E.E. degree with distinction from the University of Minnesota in 1951. In 1952 he received the M.S. degree in electrical engineering from the same university. Mr. Mattson joined the technical staff of Bell Telephone Laboratories in 1952 and since that time has specialized in transistor circuit design work. Most of this work has been with junction-type transistors in switching or large signal applications.

R. H. Mattson

Mr. Mattson is a member of Eta Kappa Nu and Tau Beta Pi.

❖

W. T. Patton was born on April 20, 1930, in Schenectady, N. Y. He received the B.S.E.E. degree from the University of Tennessee in 1952. He joined the department of electrical engineering of the University of Tennessee in March, 1952, and worked on the research staff of its engineering experiment station.

W. T. Patton

In May, 1953, he was called to active duty in the Navy. He is presently stationed at the Boston Naval Shipyard in Boston, Mass., where he is supervising the conversion of two destroyer escort radar picket ships.

Mr. Patton is a member of Eta Kappa Nu and Tau Beta Pi.

❖

F. V. Schultz (A'32–SM'45) was born on November 7, 1910, in Petersburg, Mich. He received the B.S.E.E. degree in 1932, the M.S.E.E. degree in 1939, and the Ph.D. degree in 1950, all from the University of Michigan. After five years in industry, primarily as a radio receiver development engineer he joined the Department of Electrical Engineering of Michigan State College, where he remained from 1937 until 1941.

F. V. Schultz

During World War II Dr. Schultz was a group leader in the Radar Laboratory of the Wright Air Development Center, where he was concerned with the development of antennas and radar beacons. From 1946 to 1950 he was a research Engineer in the Engineering Research Institute of the University of Michigan. During this time Dr. Schultz was engaged in research studies on missile guidance systems and on electromagnetic wave scattering problems.

Since 1950 he has been professor of electrical engineering at the University of Tennessee, in charge of instruction and research in electronics.

He is a member of Sigma Xi, Tau Beta Pi, Phi Kappa Phi, Eta Kappa Nu, the American Physical Society and the American Society for Engineering Education.

❖

W. Serniuk

W. Serniuk (S'41–A'43–M'46–SM'50) was born on December 4, 1919, in Elizabeth, N. J. He received the B.S. degree in engineering physics from the University of Michigan in 1942, and the M.S.E.E. degree from the Polytechnic Institute of Brooklyn in 1953.

He joined Sylvania Electric Products, Inc., as an engineer in 1942. During World War II, he worked on the development of proximity fuzes at Sylvania's Appliance Division in Ipswich, Mass.

In 1945, he was transferred to the Physics Laboratories at Bayside, N. Y. where he was head of the Systems Engineering and Techniques Section. He joined the staff of the Electronic Defense Laboratory at Mountain View, Calif. in 1953, and is now manager at the equipment branch.

Mr. Serniuk is a member of Tau Beta Pi, Sigma Xi, and Phi Kappa Phi.

❖

W. Sichak

W. Sichak (M'46) was born on January 7, 1916, in Lyndora, Pa. He received the B.A. degree in physics from Allegheny College in 1942.

From 1942 to 1945, he was engaged in developing microwave radar antennas at the Radiation Laboratory of Massachusetts Institute of Technology. Since then, he has been with Federal Telecommunication Laboratories, working on microwave antennas and allied equipment.

Mr. Sichak is an associate director of the Radio Communication Laboratory. He is a member of the American Physical Society.

❖

J. D. Tillman

J. D. Tillman (M'53) was born in July, 1921, in Evansville, Ind. He attended Evansville College and the University of Tennessee, and received the B.S.E.E. degree in 1947. In 1950, he received the M.S. degree from the same university. He has been on the staff of the electrical engineering department there since 1947, and is now an assistant professor.

Mr. Tillman has been engaged mainly in antenna research since 1951. He is a member of Tau Beta Pi, Eta Kappa Nu, Phi Kappa Phi, the American Institute of Electrical Engineers, the Audio Engineering Society, and the American Society for Engineering Education.

❖

A. van der Ziel

A van der Ziel (SM'49) was born at Zandeweer, The Netherlands, on December 12, 1910. From 1928 to 1934 he studied physics at the University of Groningen, The Netherlands, where he received his Ph.D. in 1934.

He was a member of the research staff of the Physics Laboratory of N. V. Philips' Gloeilampenfabrieken, Eindhoven, The Netherlands, from 1934 to 1947. From 1947 to he was an associate professor at the University of British Columbia, Vancouver, Canada, and has been professor of electrical engineering at the University of Minnesota since 1950.

He is a member of the American Physical Society and Sigma Xi.

❖

For a photograph and biography of J. R Whinnery, see page 106 of the January 1955 issue of the Proceedings of the IRE

IRE News and Radio Notes

SAN FRANCISCO TO BE SITE FOR SEMICONDUCTOR SYMPOSIUM

The Fourth Annual Semiconductor Symposium of the Electrochemical Society will be held at the Mark Hopkins Hotel, San Francisco, Calif., April 29–May 3.

Two half-day sessions on semiconducting materials (elemental, alloys, and compounds), one half-day session on surface controlled phenomena, and one half-day session on chemical process technology are planned. In each area there will be, one review paper on the state of the field, presentations of new information, and "late news" presentations.

Persons wishing to offer papers at the symposium should notify the General Chairman of the titles of their proposed papers no later than November 15. A 75-word abstract, which will be printed in the meeting program, should be submitted no later than January 15. An additional 1,000-word extended abstract, including brief pertinent data, illustrations, and curves, should be submitted before February 1. This second abstract will be printed in a booklet, *Enlarged Abstracts of Papers Presented by the Electronics Division*, which will be available at cost at the symposium.

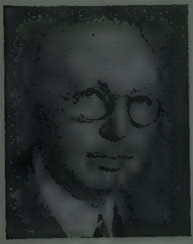
Persons wishing to make ten-minute, "late news" presentations should send word of either the title or subject to the General Chairman as soon as possible. The deadline for 75-word abstracts on these papers is April 8. These titles and abstracts will not be included in the meeting program nor the *Enlarged Abstracts*, but mimeographed copies will be available prior to the meeting.

All material intended for presentation at the symposium should be submitted to the General Chairman, J. W. Faust, Jr., Westinghouse Research Labs., Beulah Road, Churchill Borough, Pittsburgh 35, Pa.

JOINT COMPUTER CONFERENCE PROCEEDINGS NOW AVAILABLE

The 1955 Proceedings of the Western Joint Computer Conference is now available at IRE headquarters at $3.00 per copy. These *Proceedings* include the papers presented at the conference in Los Angeles, March 1–3. The conference was jointly sponsored by the IRE, AIEE, and the Association for Computing Machinery.

IRE Will Present Hogan, Bullington and Hinman with 1956 Awards at National Convention Next March


J. V. L. HOGAN

The Institute of Radio Engineers has made John V. L. Hogan, President of Hogan Laboratories and founder of station WQXR, the recipient of the IRE Medal of Honor, highest technical award in the radio engineering profession. The award, given "for his contributions to the electronic field as a founder and builder of The Institute of Radio Engineers, for the long sequence of his inventions, and for his continuing activity in the development of devices and systems useful in the communications art," will be presented during the IRE National Convention in New York City next March.

Mr. Hogan began his career in 1906 as a laboratory assistant to Lee De Forest. From 1910 to 1921 he held posts with the National Electric Signaling Company and the International Radio Telegraph Company. He then became a consulting engineer in New York City. He is responsible for many inventions in radio, television, and facsimile fields, and was founder and owner of station WQXR, until it was acquired by *The New York Times*. Mr. Hogan is president of Hogan Laboratories, Inc., New York City. In 1912 he helped found the Institute of Radio Engineers, served as Vice-President from 1916 to 1919, and President in 1920. He has served frequently on the Board of Directors as well as on many IRE committees.

K. BULLINGTON

The Morris Liebmann Memorial Prize, awarded annually for a recent, important contribution to radio engineering was given to Kenneth Bullington, Bell Telephone Laboratories, "for his contributions to the knowledge of tropospheric transmission beyond the horizon, and to the application of the principles of such transmission to practical communications systems."

Mr. Bullington joined Bell Telephone Laboratories in 1937 and since that time has been engaged almost entirely in studies relating to the propagation of radio waves. His work on scatter propagation has been a major factor in extending the range of military communications systems.

W. S. HINMAN

Wilbur S. Hinman, Jr., Director of the Diamond Ordnance Fuze Laboratories, has been awarded the Harry Diamond Memorial Award, given to persons in government service for outstanding work in radio and electronics. It was presented "for his contributions to the electronic art in the fields of meteorology and proximity fuzes."

Mr. Hinman has contributed to aircraft navigation aids, radiosondes for obtaining information on upper-air weather, and the proximity fuze.

Calendar of Coming Events

IRE East Coast Conference on Aeronautical and Navigational Electronics, Lord Baltimore Hotel, Baltimore, Md., Oct. 31–Nov. 1

Symposium on Applied Solar Energy, Westward Ho Hotel, Phoenix, Ariz., Nov. 1–5

Kansas City Section Electronics Conference, Kansas City, Kansas, Nov. 3–4

IRE-AIEE-ACM Eastern Joint Computer Conference, Hotel Statler, Boston, Nov. 7–9

IRE-AIEE-ISA Electrical Techniques in Medicine and Biology, Shoreham Hotel, Washington, D. C., Nov. 14–16

Second International Automation Exposition, Chicago Navy Pier, Chicago, Illinois, November 14–17

American Society for Quality Control, Tenth Mid-West Conference, Schroeder Hotel, Milwaukee, Wisconsin, November 17–18

IRE-PGCS Symposium on Aeronautical Communications—Civil and Military; Utica, New York, Nov. 21–22

PGI and Atlanta Section Data Processing Symposium, Hotel Biltmore, Atlanta, Ga., Nov. 28–30

EJC Nuclear Science and Engineering Congress, Cleveland, Ohio, December 12–16

IRE Second National Symposium on Reliability and Quality Control, Hotel Statler, Washington, D. C., January 9–10

PGEC Dallas-Ft. Worth Chapter Simulation Symposium, Dallas, Texas, Jan. 19–21

IRE-AIEE-U. of Pa. Conference on Transistor Circuits, University of Pennsylvania, Philadelphia, Pa., Feb. 16–17

IRE National Convention, New York, March 19–22

BPI Symposium on Nonlinear Circuit Analysis, II, Engineering Societies Building, New York, April 25–27

Electrochemical Society Semiconductor Symposium, Mark Hopkins Hotel, San Francisco, Calif., April 29–May 3

IRE-AIEE-RETMA WCEMA Electronics Components Conference, Washington, D. C., May 1–3

IRE National Aeronautical and Navigational Electronics Conference, Biltmore Hotel, Dayton, Ohio, May 14–16

IRE-AIEE-IAS-ISA National Telemetering Conference, Statler Hotel, Los Angeles, California, August 21–25

Two Foreign Sections Added

At its September meeting, the IRE Board of Directors approved the establishment of two foreign Sections, the Newfoundland Section and the Egypt Section. Newfoundland thus becomes the tenth Section to be located in Canada. The other Canadian Sections are Alberta, Bay of Quinte, Hamilton, London, Montreal, Ottawa, Toronto, Vancouver, and Winnipeg. Egypt joins the Israel Section in the Near East area. Other links in the expanding chain of international IRE activity are foreign Sections located in Buenos Aires and Hawaii. Sixty-four additional Sections exist within the continental United States.

Previously on May 4, the Westchester County Subsection of the New York Section had been established. The establishment of the Piedmont Subsection in the North Carolina-Virginia Section followed at the September meeting.

Advisory Board Chosen for Washington Symposium on Reliability and Quality Control

The Advisory Board for the Symposium on Reliability and Quality Control in Electronics, to be held January 9 and 10 in Washington, has been chosen recently. The function of the board will be to prepare a program of interest and value to IRE members. A cross section of military, government, commercial, and industrial activities are represented by the members of the board. The members will review papers, recommend general subjects, and moderate some of the symposium sessions.

The Advisory Board is made up of: *Max Batsel*, RCA; *Capt. Rawson Bennett*, USN; *Capt. Henry Bernstein*, USN; *M. Barry Carlton*, Magnavox; *Brig. Gen. William P. Farnsworth*, USAF; *Dr. Robert D. Huntoon*, Nat. Bureau of Stds.; *L. A. Hyland*, Hughes Aircraft Co.; *John Keto*, Wright Air Development Center; *W. H. Martin*, Dep. Ass. Secretary of Defense; *Dr. J. W. McRae*, Sandia Corporation; *D. E. Noble*, Motorola, Inc.; *Dr. Louis Ridenour*, Lockheed Aircraft Corp.; *Dr. A. L. Samuel*, IBM Corp.; *Major Gen. Leslie E. Simon*, U. S. Army; *Julian K. Sprague*, Sprague Electric Co.

Communications Engineering Society Formed in Germany

The Association of German Electrical Engineers (VDE), Frankfort/Main, recently founded a new subdivision, the Society of Communications Engineers (Nachrichtentechnische Gesellschaft, NTG). The society is subdivided into twenty sections covering all fields of communications engineering. Darmstadt is the headquarters for this new, nation-wide, nonprofit organization. The present membership of 1,000 is headed by Hans Busch of the Technological Institute, Darmstadt, President; and Hans Jakob Piloty of the Technological Institute, Munich, Vice-President.

Canadian IRE Convention Set for Toronto October 1–3, 1956

C. A. Norris

C. A. Norris, General Chairman, will head the Convention Committee for the Canadian IRE Convention and Show in Toronto, October 1–3, 1956.

The convention, featuring more than 200 engineering exhibits, will meet in a new building to be erected at the Canadian National Exhibition. It will be the first held in this building, which houses an auditorium, theater, committee rooms, and restaurant facilities.

Other committee chairmen include: E. O. Swan, *Exhibits and Registration;* E. L. Palin, *Social Activities;* R. C. Poulter, *Advertising, Publicity and Program;* G. Sinclair, *Technical Program;* C. H. Hathaway, *Finances;* C. Eastwood, *Recording Secretary;* C. Simmonds, *Corresponding Secretary;* and F. H. R. Pounsett, *Liaison with IRE Region Eight.* A. P. H. Barclay, *Chairman of the Toronto Section,* is an *ex-officio* member of the committee.

Further information may be obtained from: R. C. Poulter, Canadian IRE Convention, Radio College of Canada, 86 Bathurst Street, Toronto 2B, Ontario.

Gaudreau to Direct Conveyor Automation Clinic Sessions

Armand T. Gaudreau, Management Consultant, will direct the Conveyor Automation Clinic sessions at the Second International Automation Exposition, Chicago Navy Pier, November 14–17. Each lecture will be focused on a phase of the application of conveyors in supplying the prime mechanism to automation: work positioning at the machines, inter-machine transfers of materials, inter-flow handling of materials, inter-building transportation of materials, automatic handling from assembly to storage, integrating material flows through production.

The following conveyor manufacturer exhibitors are participating in the Conveyor Clinic: Chainveyor Corp., Mechanical Handling Systems, Inc., Jervis B. Webb Co.

The Electronic Computer Clinic will be repeated this year but will be twice as large. The clinic will again be under the direction of Milton Aronson, Editor of *Instruments and Automation.* The following exhibitors will make up the Computer Clinic: Austin Co., Special Devices Division; Bendix Computer Division; Berkeley Division, Beckman Instrument Co.; Clevite-Brush Development Co.; Electronic Associates, Inc.; Goodyear Aircraft Corp.; International Business Machines Co.; Librascope, Inc.; Teleregister Corp.

Standard Acoustical Terminology to Be Revised in June

American Standard Acoustical Terminology Z24.1–1951 is being revised to correct errors and to add definitions needed in the widening field of acoustics. A draft will be submitted to the American Standard Sectional Committee Z24 in June, 1956. The revision is being based largely on comments already received on the existing standard.

Suggested revisions should be sent immediately to the Chairman of Writing Group Z24-W-5, Robert W. Young, U. S. Navy Electronics Laboratory, San Diego 52, California.

P.G. on Communications Systems Holds Symposium this Month

The Professional Group on Communications Systems has announced that the first Aeronautical Communications Symposium will be held at the Hotel Utica, Utica, N. Y., November 21–22.

Many engineering concerns in the United States will exhibit their products, and a variety of technical papers, covering both military and civilian aspects of aeronautical communications systems will be presented by proponents. The symposium will stress both ground-to-ground and ground-to-air communications systems used to support present-day aeronautical activities.

Several social events are also planned for those attending the symposium, and the $2.00 registration fee to members and nonmembers permits full participation in the symposium.

Professional Group News

Three New Chapters Approved

On September 7, the Executive Committee approved the establishment of three new Professional Group Chapters: Denver Chapter, PG on Antennas and Propagation; San Francisco Chapter, PG on Production Techniques; Los Angeles Chapter, PG on Microwave Theory and Techniques.

Obituary

Edward L. Nelson (A'19–M'25–F'38), former radio and military development engineer at Bell Telephone Laboratories, at Whippany, N. J., died recently.

A veteran of more than thirty-four years with the Bell System when he retired in 1951, Mr. Nelson had specialized in the development of radio-telephone systems and radio transmitters and receivers during the greater part of his career with Bell Laboratories.

During World War II, he was in charge of a group of engineers in the development of radar sets for aircraft and ships. Upon his retirement, he became technical director of the Signal Corps Engineering Laboratory at Fort Monmouth, N. J. He was named chief scientist of the Signal Corps' research and development division in Washington about a year ago.

Born in Warsaw, Indiana in 1891, Mr. Nelson received the B.S. degree in electrical engineering from Armour Institute of Technology in 1914. Joining the IRE in 1919 he became a Fellow in 1938. He had served as an IRE Representative, a member of the Board of Editors, and as Chairman of the Broadcasting Committee.

TECHNICAL COMMITTEE NOTES

The **Electronic Computers** Committee met at IRE Headquarters on August 9 with Chairman Robert Serrell presiding. The entire meeting was devoted to discussing and amending the *Proposed Standards on Electronic Computers: Definitions of Electronic Computer Terms.*

J. E. Eiselein presided at a meeting of the **Industrial Electronics** Committee on September 7 at IRE Headquarters. A request was made to the committee to actively assist in the immediate future in the procurement of papers for the annual sessions in March of 1956. It is the intent of the committee to offer any papers made available particularly to the Professional Group on Industrial Electronics or the Professional Group on Production Techniques.

The committee reviewed the subcommittee personnel and announced the addition of Subcommittee 10.3 on Industrial Electronics Instrumentation and Control with E. Mittelmann as chairman. The overall program for expansion in the Industrial Electronics Committee both in membership and activity has dictated the need for this new subcommittee. Two basic areas of work are planned for the immediate future: a detailed compilation of transducer categories, the solder problem in general with particular attention to the problems of automation.

The **Recording and Reproducing** Committee met on September 7 at IRE Headquarters with A. W. Friend presiding. A major portion of the meeting was devoted to the discussion of high fidelity standards in connection with an editorial entitled "High Fidelity at the Crossroads" from the June issue of *Tele-Tech.* This editorial was brought to the attention of the committee by B. B. Bauer, Secretary-Treasurer of the Professional Group on Audio. The following recommendation was decided upon by the committee: "The Recording and Reproducing Committee recommends that the Chairmen of the Audio Techniques Committee, IRE 3, the Electroacoustics Committee, IRE 6, and the Recording and Reproducing Committee, IRE 19, jointly prepare a letter to Mr. Bauer in answer to his letter of June 17 concerning standards on high fidelity. The committee is sympathetic to the needs of the growing industry and wishes to cooperate in any permissible way. In this regard, a list of all pertinent existing standards of the professional and trade organizations is in preparation. This list will be made available to all interested groups. This letter should include (1) that it is not within the scope of their operation to set up a dividing line between high fidelity and non high fidelity; (2) insofar as standardization of measurement techniques is concerned, the IRE is already engaged in such standardization; and (3) any standards on techniques of measurement that apply to equipment in general, also apply to high fidelity."

Books

Basic Theory in Electrical Engineering by R. G. Kloeffler and E. L. Sitz

Published (1955) by Macmillan Co., 605 Fifth Ave., New York 11, N.Y. 321 pages+4 page index +viii pages. Illustrated. 5¾×8½. $5.50.

This book is written as a text for sophomore college students majoring in electronics, communications or electric power. It covers dc circuits and steady-state fields while laying the groundwork for ac circuits and fields. Although it is somewhat shorter than many other well-known texts, the authors have done an exceptionally fine piece of work in retaining the more fundamental material so that the book does not suffer from omission of vital information and training. The chapter on solution of electric circuits is well done, including presentation of both mesh and nodal methods of solution as well as Thevenin's and Norton's theorem. A wealth of problems throughout the book gives the instructor a wide choice of material to assign the student.

On the other hand, there seems little other than the excellent organization in this book which is new compared to older texts. As in most books, for example, a true vector notation is not used in the treatment of magnetic and electric fields. The authors state in the chapter on the magnetic circuit that H and B are vectors, symbolize them by bold-face type, yet treat them as scalars in most of the equations. They have added a final chapter, "Introduction to Electromagnetic Waves," in which they include the concept of dot products, but even here their symbology does not conform to the latest standards established by IRE and other cooperating organizations.

On the whole, the book should prove quite satisfactory as a text for sophomore students and is a creditable contribution to the literature in this field.

AUSTIN V. EASTMAN
University of Washington
Seattle, Washington

Amplitude-Frequency Characteristics of Ladder Networks by E. Green

Published (1955) by Marconi's Wireless Telegraph Co., Ltd., Marconi House, Chelmsford, Essex, England. 117 pages+iii pages+38 appendices. 88 Figures. 10×7½. 25 s.

This book deals with the analysis and synthesis of ladder networks and is directed toward the design engineer who is working in the rf power field or small signal field.

The book covers filter characteristics of ladder networks. Three types of responses included in this treatment are undercoupled, maximally flat, and equal ripple (Tchebysheff). The attack is from a low pass filter to a band pass, high pass or a band elimination response. The transformations necessary to go from the low pass filter are quite simple.

There is a section on application which includes the design of networks using vacuum tubes in which a power bandwidth figure of merit or gain bandwidth figures of merit are used. These are utilized to obtain the optimum performance of such circuits. One of the gain bandwidth figures of merit depends upon there being equal terminal capacities and the other depends upon there being equal terminal volts.

The volume is divided into about a dozen parts. Among them is a good section on broadband matching of reactive loads. The reflection coefficient was rather easily handled. Also, in a section called filters, the attenuation characteristics outside of the primary response region is mentioned. In addition, there is a small section on the input impedance or admittance of maximally flat and equal ripple filters.

Green's book contains many helpful and important tables. There are numerous function plots and comparisons between maximally flat and equal ripple type filters, a few well chosen examples illustrate certain basic operations leading to the synthesis of filters.

This work is an outstanding contribution in its field, although the style of presentation leaves much to be desired. The very abbreviated style depends heavily upon the list of symbols and much is left to the imagination. The author only hints at certain conclusions and how they fit into the picture. Ideas are often lightly sketched. Clear thinking and directed endeavor are required to follow the book closely. For some purposes this style of presentation would be desirable since it is thought-provoking.

This book could be used by anyone with filter problems. Its most fruitful targets, however, are those people who are already familiar with filter problems and their solutions.

WILLIAM E. RICHESON, JR.
Stanford Research Institute
Menlo Park, California

Elements of Servomechanism by George J. Thaler

Published (1955) by McGraw-Hill Book Co., Inc., 330 West 42 St., New York 36, N. Y. 264 pages+4 page index+x pages. Illustrated. 9¼×6¼. $7.50.

As stated in the preface, "The material in this text is intended for a one-semester senior undergraduate course." The book fulfills its intentions well, and does not contain any advanced analysis or synthesis methods which might interest an advanced student or an engineer experienced in the field.

The book itself is brief but well organized. There is a complete introduction and summary for each chapter, and each chapter contains a different topic which developes logically and naturally from the preceding chapters and topics. Reference is frequently made to practical considerations. This is particularly interesting and helpful in an introductory book. The discussions in the early chapter concerning system performance and definitions are brief but complete and serve to acquaint the reader with the function of a feedback control system, its purpose, and its design problems. The actual system components, their use and construction are adequately discussed in the second appendix.

The illustrations, are plentiful, clear, and exceptionally complete, especially where system transient responses are described. In fact, the figures showing system transient responses for various non-linearities make a valuable reference.

This book is unique in that transfer functions and stability criteria are developed without recourse to the Laplace Transform in the text. However, an introduction to the Laplace Transform is given in an appendix. The reader is also introduced to advanced linear analysis in one chapter and to nonlinear analysis in the last chapter. These chapters serve as incentives for further study.

Perhaps the chief detriment to the book may be found in its brevity. Frequently, short statements are made about system performance and methods of analysis as if they were definite rules. These statements may prove misleading to the uninitiated. For instance, in a transient response discussion in Chapter Two, a quadratic system is referred to, and it is implied from its responses that any system with an overshoot always has a frequency of oscillation from which the performance of the system may be estimated. However, stable servomechanisms with two integrations may be designed with a large overshoot, but without apparent oscillations. In another case it is stated that "Block diagrams . . . aid in setting up equations for systems." Actually, it is more fundamental and correct to set up block diagrams from system equations. Of course, when used as a textbook in college, it could be supplemented with more detailed information from an instructor.

Although brief, this book is a well written introduction to the elements of servomechanisms through the particular medium of the frequency response.

George S. Axelby
Westinghouse Electric Corp.
Baltimore, Maryland

Networks, Lines, and Fields by John D. Ryder

Published (1955) by Prentice-Hall, 705 Fifth Ave., New York, N.Y. 564 pages+7 page index+xi pages. Illustrated. $5\frac{3}{4} \times 8\frac{3}{4}$ $7.65.

This book, a slightly modified and somewhat expanded revision, is the second edition of Dean Ryder's earlier text, which was favorably received when it first appeared in 1949. Several new chapters have been added, the chapter titles now read as follows: "Net work Transformations," "Resonance," "Impedance Transformation and Coupled Circuits," "Filters," "Transmission Line Parameters," "Transmission Line Theory," "The Line at Radio Frequencies," "The Line at Power Frequencies," "Equations of the Electromagnetic Field, Radiation," "Transmission and Reflection of Plane Waves at Boundaries," "Guided Waves between Parallel Planes," "Wave Guides," "Radiation into Space."

The book seems to divide itself into three major sections. The first part, comprising four chapters, is largely one of general network analysis. It begins with a study of most of the important topics of network analysis, with a reasonably adequate discussion of the loop analysis, the node analysis, and the important network theorems. Frequency selective networks are discussed, and an account is given of the Foster Reactance theorem. A fairly good description is given of magnetically coupled circuits. A reasonably standard treatment of filters of type-K and the m-derived types is available.

The second important division, also consisting of four chapters, is devoted largely to transmission line phenomena. A complete treatment is given of the determination of the parameters of transmission lines: the single line, and multiple conductors with various conductor arrangements, symmetrical and unsymmetrical. Transmission line theory is presented largely in terms of the exponential factors and reflection factors in order to stress the wave character of the transmission. The line at radio frequencies is presented in a manner to stress the problem of standing waves, and also to show the impedance transforming properties of rf line devices. The rectangular impedance chart and the Smith chart are introduced, and a number of problems are studied with their use. A discussion is included of the line at power frequencies.

The last five chapters constitute the final part of the book and concern themselves with guided and radiated electromagnetic fields. A chapter is included on the essential aspects of the electromagnetic field equations, the plane wave, and the Poynting theorem. A complete account is given of the transmission and reflection of plane waves at boundaries. This is followed by a discussion of guided waves between parallel planes. The region of propagation is then confined by added boundaries thereby leading to the study of wave guides. An introduction to the essentials of radiation into space, the elements of antenna theory, and the radiation properties of several selected radiators, completes the text.

On the whole the writing is lucid, and the explanations good. Issue can be taken with the author on a number of occasions, but in most cases these are small matters. For example, the reference positive polarity has not been indicated in all cases, although these have been included where specifically required. A consistent policy of reference positive polarity markings would have been desirable, the use of e and V for potential difference serves only to complicate a network analysis development; the discussion in Section 1–17 of the Parallel-T network proceeds much more directly by a node analysis. On page 42, for the sake of generality, the expansion of a determinant in terms of minors or cofactors should have been included, the discussion of the Foster reactance theorem is largely extraneous in its present environment. It is only one of many synthesis techniques, and as the general synthesis problem is not examined, this might well have been omitted. A number of other similar points can be raised throughout the text.

It is anticipated that the book will be accorded a favorable reception, as it does provide the student and the practicing engineer with the essential background and analytical techniques for handling a large group of important network configurations under steady state excitation.

Samuel Seely
Syracuse University
Syracuse, New York

Experiments in Electronics and Communication Engineering by E. H. Schulz, L. T. Anderson, R. M. Leger.

Published (1955) by Harpers and Bros., 49 E. 33 St., New York 16, N. Y. 339 pages+3 page index+viii pages. Illus. $9\frac{1}{4} \times 6\frac{1}{4}$. $6.00.

This is a second edition of a laboratory manual, published in 1943, designed to serve the needs of war training programs of college grade in World War II. This second edition embodies a thorough revision of the material to bring it up to date, and is intended primarily for college courses in conjunction with the theoretical courses in communications engineering.

Ninety-three experiments are presented, giving a very complete coverage of communications networks, electronics, and the applications of vacuum tubes. It is not intended that the experiments be performed in any fixed order. For example, the experiment on the cathode-ray oscillograph and its uses as a measuring instrument would naturally precede experiments where it is used as an auxiliary equipment.

A notable feature of the book is the able presentation of the theory of each experiment which precedes suggestions for the apparatus to be used and the general nature of the measurements which are to be made. Except in the case of some of the more elaborate setups, the theory given is sufficient. In certain cases, further reading is desirable. This would naturally be available if the experimental work is kept reasonably in step with the theoretical courses.

The authors suggest, in the chapter on laboratory technique, their belief that laboratory directions should be general, rather than detailed, so as to develop initiative in the student. In the judgment of this reviewer, this purpose will be served if the laboratory work be so assigned and supervised as to give it effectiveness as demonstration material for the theoretical part of the course. This manual should be found valuable for such an integrated course.

Frederick W. Grover
Union College
Schenectady, N. Y.

Second Thoughts on Radio Theory by "Cathode Ray"

Published (1955) by Iliffe and Sons Ltd., Dorset House, Stamford St., London, England. 403 pages+6 page index. Illus. $8\frac{3}{4} \times 5\frac{3}{4}$. 25 s.

The "second thoughts" contained in this book might well have been called a "fresh look" at basic radio-frequency concepts. They are a lively exploration of the fundamentals of radio circuits, transmission, techniques and mathematics. Readers of *Wireless World* will be pleased to find here a collection of some forty of the articles by "Cathode Ray" which have previously been published in that magazine. Other readers will learn that even radio mathematics can be intelligible, interesting, and sometimes even humorous.

In its utility to the student and worker in radio, the book reminds the reviewer of the *Wireless Telegraphist's Pocket Book of Notes, Formulae and Calculations* by Professor J. A. Fleming, which was published in England in 1915, and which continued to be a classic reference book for many years.

The forty-four chapters are arranged in four groups: Basic Ideas, Circuit Elements and Techniques, Circuit Calculations, and In Lighter Mood. Illustrative of the author's treatment of the subjects is Chapter Nine on "Phase." Here, after citing a lecture in which the famous Dutch professor, Dr. Balth van der Pol referred to the large variety of definitions which have appeared in books and then gave his own choice, this author sets forth a straightforward and quite informal discussion of what to many is the rather abstruse concept of "phase." He makes it far from abstruse. After describing its existence "in an operation which occurs periodically" as "the stage or state to which the operation has proceeded," he illustrates "phase" in terms of the mass production of a radio receiver and then in terms of the pulses radiated by a radar transmitter. The appealing manner of the author's presentation is indicated by the titles of the successive sections of this chapter. They are: "What Kind of Thing Is It?" "A More Precise Definition," "Phase Difference," "Some Wrong Ideas," "Constant and Variable Phase Difference," "Phase and Waveform," "Phase Angle," and "Summary."

This is a book of contrasts in moods, but of great consistency in readability. It is a book which one likes to have on his table for technical browsing. One wishes that the author had not chosen to hide his identity behind a nom de plume.

The usefullness of the book is enhanced by a six-page index. At the end there are presented, with some humorous overtones, the answers to a dozen problems which are, here and there, posed for the reader.

LAURENS E. WHITTEMORE
American Telephone and Telegraph Co.
New York, N. Y.

Report of the Physical Society Conference on the Physics of the Ionosphere

Published (1955) by The Physical Society, 1 Lowther Gardens, Prince Consort Rd., London S.W. England. 406 pages. Illus. $10\frac{1}{4}\times 7$. 40 s.

This is a book primarily intended for the serious student of ionospheric physics. It contains a series of fifty papers on the physics of the ionosphere in relation to radio wave propagation. These papers were submitted in connection with a scientific conference held in September 1954 at Cambridge University. While most of the contributions are concerned with current research there are four survey papers dealing with: the lowest ionosphere, A. H. Waymick; irregularities and movements in the ionosphere, J. A. Ratcliffe, the ionospheric F-2 layer, D. F. Martyn; and the mathematics of wave propagation through the ionosphere, K. G. Budden.

A feature of the conference was a presentation by D. K. Bailey of the hitherto classified work that has been done in recent years by the Bureau of Standards on long distance ionospheric scatter-transmission at VHF. It is unfortunate that the account of this work included in the book is only a summary written from notes taken at the conference. Readers may like to compare this summary (paper 12) with a contribution by W. Dieminger on short wave echoes from the lower ionosphere (paper 5). The two papers describe what are at first sight two different phenomena, but in discussion at the conference it seemed quite likely that the two phenomena are in reality the same.

HENRY G. BOOKER
Cornell University
Ithaca, N. Y.

Principles of Communication Systems by W. D. Hershberger

Published (1955) by Prentice-Hall, Inc., 70 Fifth Avenue, New York 11, N. Y. 244 pages+5 page index+xiii pages. Illus. $8\frac{1}{2}\times 5\frac{3}{4}$. $6.65.

There is a great need in the field of communications for a book like this one where, as the cover blurb states, emphasis is not placed on the "hardware" of any particular system, but on topics such as signals and their spectra, information theory, and detection. It states that after considering the characteristics of channels useful in communication—radio and transmission lines, in particular—the author examines human and other factors which determine the design and limit the performance of any given system.

The author faithfully follows the blurb in his chapter outline: first a chapter discussing the makeup of a communication system, then signals and their spectra, followed by a chapter on information and rate of transmission of information. Next the contents calls for a chapter on noise, one on modulation and detection, another on transmission lines, and then the background is concluded by a chapter on characteristics of radio waves. The last hundred pages deals with systems, including chapters on audio frequency systems, radar systems, television, and the design of communication systems.

Unfortunately the outline is the best part of the book because the contents are just not there. Important equations are given without background or derivation—the Hartley-Shannon equation, the autocorrelation function, and others—while unimportant equations for this study such as the transmission line equations are derived in detail. Most of the book is taken up with discussions of material that should have been covered in elementary and intermediate radio courses and very little is presented on the relationship of system concepts to information theory, noise, modulation, and detection. The chapter on the design of communication systems is eight pages long. However, the book would make an interesting few hours reading for someone wanting an elementary survey of communication systems.

NATHAN MARCHAND
Marchand Electronic Laboratories
Bryam, Connecticut

RECENT BOOKS

Buchsbaum, Walter H., *Color TV Servicing*. Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N.Y. $6.35.

Halliday, David, *Introductory Nuclear Physics*. John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $7.50.

Infrared: A Library of Congress Bibliography. PB 111643. Office of Technical Services, U. S. Dept. of Commerce, Washington, D. C. $3.00.

Ireson, W. G., and Grant, E. L., *Handbook of Industrial Engineering and Management*. Prentice-Hall, Inc., 70 Fifth Ave., N. Y. 11, N. Y. $16.00.

June, Stephen A., Bardis, J. D., Lurio, L. H., Polaner, L. S., Sagedahl, O., Skleanr, H. A., Yenken, B. K., *The Automatic Factor*. Instruments Pub. Co., 845 Ridge Ave., Pittsburgh 12, Pa. $1.50.

Mobile Manual for Radio Amateurs. American Radio Relay League, West Hartford, Connecticut. $2.50.

Proceedings on the Eighth Annual Conference on the Administration of Research. New York University Press, Washington Square, New York 3, N. Y. $4.00.

Proceedings of the Mixed Commission on the Ionosphere. General Secretariat of U.R.S.I., 42 Rue des Minimes, Brussels, Belgium, $6.00.

Spreadbury, E. A. W., *Television Receiver Servicing*. Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, England. 21 s.

U.R.S.I. Proceedings of the XI General Assembly: Vol. Ten, Part Four. General Secretariat of U.R.S.I., 42 Rue des Minimes, Brussels, Belgium. $1.20.

Professional Groups†

Aeronautical & Navigational Electronics—Edgar A. Post, Navigational Aides, United Air Lines, Operations Base, Stapleton Field, Denver 7, Colo.

Antennas & Propagation—Delmer C. Ports, Jansky & Bailey, 1339 Wisconsin Ave., N.W., Washington 7, D. C.

Audio—*Chairman*, W. E. Kock, Bell Tel. Labs., Murray Hill, N. J.

Automatic Control—Robert B. Wilcox, Raytheon Manufacturing Co., 148 California St., Newton 58, Mass.

Broadcast & Television Receivers—W. P. Boothroyd, Philco Corp., Philadelphia Pa.

Broadcast Transmission Systems—O. W. B. Reed, Jr., Jansky & Bailey, 1735 DeSales St., N.W., Washington, D. C.

Circuit Theory—J. Carlin, Microwave Res. Inst., Polytechnic Inst. of Brooklyn, 55 Johnson St., Brooklyn 1, N. Y.

Communications Systems—A. C. Peterson, Jr., Bell Labs., 463 West St., New York 14, N. Y.

Component Parts—A. W. Rogers, Comp. & Materials Branch, Squier Signal Lab., Ft. Monmouth, N. J.

Electron Devices—J. S. Saby, Electronics Laboratory, G.E. Co., Syracuse, N. Y.

Electronic Computers—J. H. Felker, Bell Labs., Whippany, N. J.

Engineering Management—Max Batsel, Engineering Products Dept., RCA Victor Div.—Bldg. 10-7, Camden, N. J.

Industrial Electronics—George P. Bosomworth, Engrg. Lab., Firestone Tire & Rubber Co., Akron 17, Ohio

Information Theory—Louis A. DeRosa, Federal Telecommunications Lab., Inc., 500 Washington Avenue, Nutley, N. J.

Instrumentation—F. G. Marble, Boonton Radio Corp., Intervale Rd., Boonton, N. J.

Medical Electronics—V. K. Zworykin, RCA Labs., Princeton, N. J.

Microwave Theory and Techniques—A. C. Beck, Box 107, Red Bank, N. J.

Nuclear Science—M. A. Schultz, Westinghouse Automatic Power Division, Bettis Field, Pittsburgh 30, Pa.

Reliability and Quality Control—Victor Wouk, Beta Electric Corp., 333 E. 103rd St., New York 29, N. Y.

Production Techniques—R. R. Batcher, 240-02—42nd Ave., Douglaston, L. I., N. Y.

Telemetry and Remote Control—C. H. Hoeppner, Stavid Engineering, Plainfield, N. J.

Ultrasonics Engineering—M. D. Fagen, Bell Labs., Whippany, N. J.

Vehicular Communication—Newton Monk, Bell Labs., 463 West St., N. Y., N. Y.

---

† Names listed are Group Chairmen.

Sections*

Akron (4)—H. L. Flowers, 2029 19 St., Cuyahoga Falls, Ohio; H. F. Lanier, 49 W. Lowell St., Akron, Ohio

Alberta (8)—J. W. Porteous, Alberta Univ., Edmonton, Alta., Canada; J. G. Leitch, 13024—123A Ave., Edmonton, Alta., Canada.

Albuquerque-Los Alamos (7)—C. A. Fowler, 3333 49 Loop, Sandia Base, Albuquerque, N. Mex.; T. G. Banks, Jr., 1124 Monroe St., S.E., Albuquerque, N. Mex.

Atlanta (3)—D. L. Finn, School of Elec. Engr'g., Georgia Inst. of Tech., Atlanta, Ga.; P. C. Toole, 605 Morningside Dr., Marietta, Ga.

Baltimore (3)—C. D. Pierson, Jr., Broadview Apts. 1126, 116 West University Pkwy., Baltimore 10, Md.; M. I. Jacob, 1505 Tredegar Ave., Catonsville 28, Md.

Bay of Quinte (8)—J. C. R. Punchard, Elec. Div., Northern Elec. Co. Ltd., Sydney St., Belleville, Ont., Canada; M. J. Waller, R.R. 1, Foxboro, Ont., Canada

Beaumont-Port Arthur (6)—L. C. Stockard, 1390 Lucas Dr., Beaumont, Texas; John Petkovsek, Jr., 4390 El Paso Ave., Beaumont, Texas

Binghamton (4)—O. T. Ling, 100 Henry Street, Binghamton, N. Y.; Arthur Hamburgen, 926 Glendale Dr., Endicott, N. Y.

Boston (1)—T. P. Cheatham, Jr., Hosmer St., Marlborough, Mass.; R. A. Waters, IRE Boston Section Office, 73 Tremont St., Room 1006, Boston 8, Mass.

Buenos Aires—J. M. Rubio, Ayacucho 1147, Buenos Aires, Argentina; J. L. Blon, Transradio Internactional, San Martin 379, Buenos Aires, Argentina

Buffalo-Niagara (1)—D. P. Welch, 859 Highland Ave., Buffalo 23, N. Y.; William S. Holmes, 1861 Ellicot Rd., West Falls, N. Y.

Cedar Rapids (5)—Ernest Pappenfus, 1101 30 Street Dr., S.E., Cedar Rapids, Iowa; E. L. Martin, 1119 23 St., S.E., Cedar Rapids, Iowa

Central Florida (3)—Hans Scharla-Nielsen, Radiation Inc., P.O. Drawer 'Q', Melbourne, Fla.; G. F. Anderson, Radiation Inc., P.O. Box 'Q', Melbourne, Fla.

Chicago (5)—J. J. Gershon, De Vry Tech. Inst., 4141 Belmont Ave., Chicago 41, Ill.; J. S. Brown, 9829 S. Hoyne Ave., Chicago 43, Ill.

Cincinnati (4)—R. A. Maher, 6133 Sunridge Drive, Cincinnati 24, Ohio; W. S. Alberts, 6533 Elwynne Dr., Silverton, Cincinnati 36, Ohio

Cleveland (4)—H. R. Mull, 4558 Silverdale Ave., North Olmsted, Ohio; W. G. Piwonka, 3121 Huntington Rd., Cleveland 20, Ohio

Columbus (4)—W. E. Rife, 6762 Rings Rd., Amlin, Ohio; R. L. Cosgriff, 2200 Homestead Dr., Columbus, Ohio.

Connecticut Valley (1)—H. E. Rohloff, The Southern New England Tel. Co., 227 Church St., New Haven, Conn.; B. R. Kamens, 45 Brooklyn Circle, New Haven 15, Conn.

Dallas-Fort Worth (6)—A. R. Teasdale, Jr., 3925 Potomac Ave., Ft. Worth 7, Tex.; C. F. Seay, Jr., Collins Radio Co., 1930 Hi-Line Dr., Dallas, Tex.

Dayton (5)—A. B. Henderson, 801 Hathaway Rd., Dayton 9, Ohio; N. A. Nelson, 310 Lewiston Rd., Dayton 9, Ohio

Denver (6)—R. E. Swanson, 1777 Kipling St., Denver 15, Colo.; S. M. Bedford, Jr., Mountain States Tel. & Tel., Room 802, Denver, Colo.

Des Moines-Ames (5)—A. A. Read, 511 Northwestern Ave., Ames, Iowa; W. L. Hughes, E. E. Dept., Iowa State College. Ames, Iowa

Detroit (4)—N. D. Saigeon, 1544 Grant, Lincoln Park 25, Mich.; A. L. Coates, 1022 E. Sixth St., Royal Oak, Mich.

Egypt—Officers to be elected.

Elmira-Corning (1)—R. A. White, 920 Grand Central Ave., Horseheads, N. Y.; R. G. Larson, 220 Lynhurst Ave., Windsor Gardens, Horseheads, N. Y.

El Paso (6)—J. F. Stuart, Box 991, El Paso, Texas; W. T. McGill, 7509 Mazatlan Rd., El Paso, Texas

Emporium (4)—E. H. Boden, R.D. 1, Emporium, Pa.; H. S. Hench, Jr., R.D. 2, Emporium, Pa.

Evansville-Owensboro (5)—E. C. Gregory, 1120 S.E. First St., Apt. B-2, Evansville, Ind.; A. K. Miegl, 904 Kelsey Ave., Evansville, Ind.

Fort Wayne (5)—J. J. Iffland, 2603 Merivale St., Kirkwood Park, Ft. Wayne 8, Inc.; T. L. Slater, 1916 Eileen Dr., Waynedale, Ind.

Hamilton (8)—G. M. Cox, 154 Victoria St., S., Kitchener, Ont., Canada; A. L. Fromanger, Box 507, Ancaster, Ont., Canada

Hawaii (7)—G. W. Clark, Box 193, Lanikai, Oahu, T. H.; J. R. Sanders, c/o Matson Navigation Co., Box 899, Honolulu, T. H.

Houston (6)—L. W. Erath, 2831 Post Oak Rd., Houston, Tex.; R. W. Olson, 267 Pine Hollow Lane, Houston 19, Tex.

Huntsville (3)—A. L. Bratcher, 308 East Holmes St., Huntsville, Ala.; W. J. Millsap, 518 Woodmont, Huntsville, Ala.

Indianapolis (5)—J. T. Watson, 407 N. Penn. 508, Indianapolis 4, Ind.; M. J. Arvin, 4329 Fletcher Ave., Indianapolis 3, Ind.

Inyokern (7)—G. D. Warr, 213-A Wasp Rd., China Lake, Calif; B. B. Jackson, 54-B Rowe St., China Lake, Calif.

Israel—Franz Ollendorf, Box 910, Hebrew Inst. of Tech., Haifa, Israel; J. H. Halberstein, P.O.B. 1, Kiriath Mozkin, Israel

Ithaca (1)—Ben Warriner, General Electric Co., Advanced Electronics Ctr., Cornell University, Ithaca, N. Y.; R. L. Wooley, 110 Cascadilla St., Ithaca, N. Y.

(*Cont'd on next page*)

---

* Numerals in parentheses following Section designate Region number. First name designates Chairman, second name, Secretary.

(Sections cont'd)

Kansas City (6)—Richard W. Fetter, 8111 W. 87 St., Overland Park, Kan.; Mrs. G. L. Curtis, Radio Industries, Inc., 1307 Central Ave., Kansas City 2, Kan.

Little Rock (6)—J. E. Wylie, 2701 N. Pierce, Little Rock, Ark.; Jim Spilman, A. R. & T. Electronics, P.O. Box 370, North Little Rock, Ark.

London (8)—C. F. MacDonald, 328 St. James St., London, Ont., Canada; J. D. B. Moore, 27 McClary Ave., London, Ont., Canada

Long Island (2)—Paul G. Hansel, Addison Lane, Greenvale, L. I., N. Y.; W. P. Frantz, Sperry Gyroscope Co., Great Neck, L. I., N. Y.

Los Angeles (7)—Walter E. Peterson, 4016 Via Cardelina, Palos Verdes Estates, Calif.; John K. Gossland, 318 E. Calaveras St., Altadena, Calif.

Louisville (5)—R. W. Mills, 1017 Eastern Pkway, Louisville 4, Ky.; L. A. Miller, 314 Republic Bldg., Louisville 2, Ky.

Lubbock (6)—R.B. Spear, 510 E. Hill St., Brownfield, Texas; J. B. Joiner, 2621 30 St., Lubbock, Texas

Miami (3)—C. S. Clemans, Station WSWN, Belle Glade, Fla.; H. F. Bernard, 3670 S.W. Ninth Terrace, Miami 34, Fla.

Milwaukee (5)—Alex Paalu, 1334 N. 29 St., Milwaukee 8, Wis.; J. E. Jacobs, 6230 S. 116 St., Hales Corner, Wis.

Montreal (8)—R. W. Cooke, Box 630, Sta. 'O', Ville St. Laurent, Que., Can., F. H. Margolick, Canadian Marconi Co., 2442 Trenton Ave., Montreal, Que., Can.

Newfoundland Section—(Officers to be elected).

New Orleans (6)—L. J. N. Du Treil, 202 Homedale Ave., New Orleans 24, La.; J. A. Cronvich, Dept. Elec. Eng'g., Tulane University, New Orleans 18, La.

New York (2)—A. C. Beck, Box 107, Red Bank, N. J.; J. S. Smith, Elec. Eng'g. Dept., New York Univ., University Heights, New York 53, N. Y.

North-Carolina-Virginia (3)—J. C. Mace, 1616 Jefferson Park Ave., Charlottesville, Va.; Allen L. Comstock, 1404 Hampton Drive, Newport News, Va.

Northern New Jersey (2)—P. S. Christaldi, Box 111, Clifton, N. J.; R. J. Kircher, 145 Maple St., Summit, N. J.

Northwest Florida (3)—K. L. Huntley, Mary Esther, Fla.; G. C. Jones, 12 N. Okaloosa Rd., Fort Walton Beach, Fla.

Oklahoma City (6)—G. W. Holt, 4420 N.W. 19 Blvd., Oklahoma City 7, Okla.; W. E. Lucey, 1348 Kinkaid Ave., Oklahoma City 9, Okla.

Omaha-Lincoln (5)—M. L. McGowan, 5544 Mason St., Omaha 6, Neb.; C. W. Rook, Dept. Elec. Eng., Univ. of Nebraska, Lincon 8, Neb.

Ottawa (8)—George Glinski, 14 Dunvegan Rd., Ottawa, Ont., Canada; C. F. Pattenson, 3 Braemar, Ottawa 2, Ont., Canada

Philadelphia (3)—C. R. Kraus, Bell Telephone Co. of Pa., 1835 Arch St., 16 Floor, Philadelphia 3, Pa.; Nels Johnson, Philco Corp., 4700 Wissahickon Ave., Philadelphia 44, Pa.

Phoenix (7)—William R. Saxon, 641 E. Missouri, Phoenix, Ariz.; G. L. McClanathan, 509 East San Juan Cove, Phoenix, Ariz.

Pittsburgh (4)—F. C. Alexander, 2824 Mt. Royal Blvd. & Sutter Rd., Glenshaw, Pa.; K. A. Taylor, Bell Tel. Co. of Pa., 416 Seventh Ave., Pittsburgh 19, Pa.

Portland (7)—Howard Vollum, 1000 N.W. Skyline Blvd., Portland, Ore.; R. R. Pooley, Radio Station KPOJ, Box 31, Portland 7, Ore.

Princeton (2)—G. C. Sziklai, Box 3, Princeton, N. J.; L. L. Burns, Jr., R.C.A. Labs., Princeton, N. J.

Rochester (1)—G. H. Haupt, 48 Van Voorhis Ave., Rochester 17, N. Y.; B. L. McArdle, Box 54, Brighton Sta., Rochester 10, N. Y.

Rome-Utica (1)—H. F. Mayer, 60 Fountain St., Clinton, N. Y.; R. S. Grisetti, 67 Route St., New Hartford, N. Y.

Sacramento (7)—R. C. Bennett, 2239 Marconi Ave., Sacramento 21, Calif.; R. A. Paucher, 3021 Mountain View Ave., Sacramento 21, Calif.

St. Louis (6)—F. A. Fillmore, 5758 Itaska St., St. Louis 9, Mo.; Christopher Efthim, 1016 Louisville Ave., St. Louis 10, Mo.

Salt Lake City (7)—A. L. Gunderson, 3906 Parkview Dr., Salt Lake City, Utah; S. B. Hammond, Engineering Hall, Univ. of Utah, Salt Lake City 1, Utah.

San Antonio (6)—C. M. Crain, Engineering Bldg. 149, University of Texas, Austin 12, Texas; W. H. Hartwig, Dept. of Elec. Engr., University of Texas, Austin 12, Texas

San Diego (7)—F. X. Brynes, 1759 Beryl St., San Diego 9, Calif.; R. T. Silberman, 4274 Middlesex Dr., San Diego, Calif.

San Francisco (7)—A. J. Morris, 1827 Cordilleras Rd., Redwood City, Calif.; J. S. McCullough, 1781 Willow St., San Jose 25, Calif.

Schenectady (1)—C. C. Allen, 2064 Baker Ave., Schenectady 9, N. Y.; A. E. Rankin, 833 Whitney Dr., Schenectady, N. Y.

Seattle (7)—A. E. Harrison, Elect. Engr'g. Dept., Univ. of Washington, Seattle 5, Wash.; R. H. Hoglund, 1825 E. Lynn St., Seattle 2, Wash.

Syracuse (1)—W. H. Hall, General Electric Co., Syracuse, N. Y.; Major A. Johnson, R.D. 1, Totman Rd., East Syracuse, N. Y.

Toledo (4)—L. S. Rynder, 140 Rockingham St., Toledo 10, Ohio; L. R. Klopfenstein, Portage, Ohio

Toronto (8)—A. P. H. Barclay, 2 Pine Ridge Dr., Toronto 13, Ont., Canada; H. W. Jackson, 352 Laird Dr., Toronto 17, Ont., Canada

Tulsa (6)—Glen Peterson S. 83 East Ave., Tulsa, Okla.; D. G. Egan, Research Lab., Carter Oil Co., Box 801, Tulsa 2, Okla.

Twin Cities (5)—F. S. Hird, Northwestern Bell Tel. Co., 224 S. Fifth St., Minneapolis, Minn.; J. L. Hill, 25 17 Ave., N.E., North St. Paul 9, Minn.

Vancouver (8)—Miles Green, North-West Tel Co., 2226 W. Tenth Ave., Vancouver, B. C., Canada; J. S. Gray, 4069 W. 13 Ave., Vancouver, B. C., Canada

Washington (3)—T. B. Jacocks, General Electric Co., 777 14 St., N.W., Washington, D. C.; R. I. Cole, 2208 Valley Circle, Alexandria, Va.

Williamsport (4)—George Amey, 968 N. Market St., Williamsport, Pa.; W. H. Brebee, 818 Park Ave., Williamsport, Pa.

Winnipeg (8)—R. M. Simister, 179 Renfrew St., Winnipeg, Man., Canada; G. R. Wallace, 400 Smithfield Ave., Winnipeg, Man., Canada

Subsections

Berkshire County (1)—S. C. Leonard, Cheshire, Mass.; W. E. Neubert, 21 Highlawn Dr., Pittsfield, Mass.

Buenaventura (7)—W. O. Bradford, 301 East Elm St., Oxnard, Calif.; M. H. Fields, 430 Roderick St., Oxnard, Calif.

Centre County (4)—W. J. Leiss, 1173 S. Atherton St., State College, Pa.

Charleston (3)—W. L. Schachte, 152 Grove St., Charleston, S. C.; Arthur Jones, 21 Madden Dr., Charleston Heights, S. C.

East Bay (7)—J. M. Rosenberg, 1134 Norwood Ave., Oakland 10, Cal.; C. W. Park, 6035 Chabolyn Terrace, Oakland, Cal.

Erie (1)—R. S. Page, 1224 Idaho Ave., Erie 10, Pa.; R. H. Tuznik, 905 E. 25 St., Erie, Pa.

Fort Huachuca (2)—Officers to be elected.

Lancaster (3)—G. W. Scott, Armstrong Cork Co., Lancaster, Pa.; G. E. Mandell, 522 E. King St., Lancaster, Pa.

Mid-Hudson (2)—E. J. Breiding, 54 S. Grand Ave., Poughkeepsie, N. Y.; E. S. Wilson, I.B.M., Poughkeepsie, N. Y.

Monmouth (2)—G. F. Senn, 81 Garden Rd., Little Silver, N. J.; C. A. Borgeson, 82 Garden Rd., Little Silver, N. J.

Orange Belt (7)—B. F. Husten, Naval Ord. Lab., Corona, Calif.; T. A. Mayeda, 3120 Locust St., Riverside, Calif.

Palo Alto (7)—John V. N. Granger, 320 Encinal Ave., Menlo Park, Calif.; W. B. Wholey, 342 Verano Dr., Los Altos, Calif.

Pasadena (7)—P. H. Reedy, 1742 Grevelia St., Apt. E, South Pasadena, Calif.; Jennings David, 585 Rim Rd., Pasadena 8, Calif.

Piedmont—Officers to be elected.

Richland (7)—R. G. Clark, 1732 Howell, Richland, Washington; R. E. Connally, 515 Cottonwood Dr., Richland, Wis.

Tucson (7)—R. C. Eddy, 1511 E. 20 St., Tucson Ariz.; P. E. Russell, Elect. Eng. Dept., Univ. Ariz., Tucson, Ariz.

USAFIT (5)—L. A. Yarbrough, Box 3001, USAFIT, Wright-Patterson AFB, Ohio; J. J. Gallagher, Box 3482 USAFIT, Wright Patterson AFB, Ohio

Weschester County (2)—Joseph Reed, 52 Hillcrest Ave., New Rochelle, N. Y.; D. S. Kellogg, 9 Bradley Farms, Chappaqua, N. Y.

Wichita (6)—H. G. Swift, 1642 South Main, Wichita, Kan.; Vernon N. Johnson, 1652 S. Edgemoor, Wichita 17, Kan.

IRE INSTRUMENTATION CONFERENCE AND EXHIBIT

SPONSORED BY THE PROFESSIONAL GROUP ON INSTRUMENTATION AND THE ATLANTA SECTION
NOVEMBER 28–30, ATLANTA, BILTMORE HOTEL

MONDAY, NOVEMBER 28

8:00 A.M.—Registration

9:00 A.M. to 10:00 P.M.—Exhibits

10:30 A.M.—OPENING SESSION

Chairman: B. J. Dasher, Georgia Institute of Technology.

"Welcome," B. J. Dasher, Conference Manager.

"Control and Power Supply Problems of Unmanned Satellites," Ernst Stuhlinger, Redstone Arsenal.

2:30 P.M.—RECORDING AND DATA UTILIZATION

Chairman: E. K. Ritter, Georgia Institute of Technology.

"A Twenty-four Channel Cathode Ray Oscilloscope for Monitoring Magnetic Tape Records," Frank C. Smith, Jr. and Robert R. Pittman, Southwestern Industrial Electronics Co.

"Simplified Automatic Data Plotter for Telemetering Systems (SADAP)," H. P. Riblet, Johns Hopkins University.

"New Airborne Recorder Design Techniques," Armand L. Klein, Ampex Corp.

"A High-Speed Reader for Perforated Tape," R. J. Bianco, Aberdeen Proving Ground.

"Permanent Digital Function Storage Using Neon Tubes," M. S. Raphael and A. S. Robinson, Columbia University.

"A Survey of Navigational Measurements Methods for Missile Guidance Systems," S. L. Johnston, Redstone Arsenal.

TUESDAY, NOVEMBER 29

9:00 A.M. to 6:00 P.M.—Exhibits

9:30 A.M.—DATA HANDLING SYSTEMS

Chairman: Thomas L. Greenwood, Redstone Arsenal.

"A Central Facility for Processing Engineering Test Data," Edward C. Allmond, Air Force Armament Center.

"Requirements of Data Processing Facilities," I. R. Heimlich, McDonnel Aircraft Co.

"A Digital Data Gathering System," C. Fanwick, J. S. Lanza and J. Ottobre, Stavid Engineering, Inc.

"Digital Solutions to Instrumentation and Automatic Control Problems," Benjamin Kessel and Robert W. Brooks, Computer Control Co.

"The Analog Computer as an Operational Test Instrument for Jet Engine Testing," L. F. Burns, W. K. McGregor, Aro Inc.

"An Analog Data Handling System," J. M. Googe, Aro Inc.

2:30 P.M.—PROCESSING TECHNIQUES

Chairman: George B. Hoadley, North Carolina State College.

"A General Purpose Electronic Multiplier," Robert A. Meyers, David Taylor Model Basin.

"The Application of Analogue Techniques to a Continuously Rotating Magnetic Drum," J. L. Douce and J. C. West, University of Manchester, Manchester, Eng.

"Rapid Automatic Digitization and Sorting of Random Graphical Data," Victor S. Carson, North Carolina State College.

"A Phase Filter Applied to Spectral Phonocardiography," F. H. Middleton, G. B. Gilbert and W. H. Huggins, Johns Hopkins University, and G. N. Webb, Johns Hopkins Hospital.

"The ORDRAT—Ordnance Dial Reader and Translator," P. M. Kintner, Ballistics Research Lab., R. E. Howard, S. B. Peterson, and R. C. Webb, Denver Research Inst.

"The Doppler Data Translator," Paul M. Kintner, Ballistics Research Laboratory, and E. J. Armotta, Potter Instrument Co.

Tuesday Evening

Cocktail Party and Banquet

Speaker: John D. Ryder, President IRE, "Engineering Is Science."

WEDNESDAY, NOVEMBER 30

9:00 A.M. to 6:00 P.M.—Exhibits

9:30 A.M.—ANALOG TO DIGITAL CONVERSION

Chairman: R. L. Sink, Consolidated Engineering Corporation.

"High-Speed Analog-Digital Convertors," Martin L. Klein, No. Am. Aviation, Inc.

"An Unusual Electronic Analog-Digital Conversion Method," Blanchard D. Smith, Jr., Melpar, Inc.

"Sine-Cosine Angular Position Encoders," Carl P. Spaulding, Datex Division, G. M. Giannini and Co., Inc.

"Precision Direct-Reading, Binary-Position Encoders," W. I. Frank and A. B. White, Electronics Corporation of America.

"Digitization of Carrier Excited Transducers Using a Programmed Attenuator," John R. Zweizig, Cal. Inst. Tech.

2:30 P.M.—TRANSDUCERS

Chairman: R. D. Hurlbert, Rich's, Inc.

"Mathematical Definitions for Transducer Measure Criteria," L. J. Fogel, Stavid Engineering, Inc.

"New Multi-Purpose Industrial Transducers," Wm. F. Newbold, John V. Werme, Minneapolis-Honeywell Regulator Co.

"A Digital Sine-Cosine Transducer," W. Henn, A. S. Robinson, Columbia Univ.

"A New DC Voltage Discriminator with Independent Control of Threshold Voltage and Voltage Differential," N. Paul Stucky, Minneapolis-Honeywell Regulator Co.

"A Binary Coded Decimal Convertor," Martin Ziserman, The Norden Laboratories.

EIGHTH ANNUAL CONFERENCE ON ELECTRICAL TECHNIQUES IN MEDICINE AND BIOLOGY

SPONSORED BY IRE, AIEE, AND ISA, SHOREHAM HOTEL, WASHINGTON, D. C., NOVEMBER 14–16

Morning, November 14

RECENT ADVANCES IN ANGIOCARDIOGRAPHY

Chairman: Theodore F. Hilbish, M.D. M.P.H., Chief, Diagnostic Radiological Service, Nat. Inst. Health, Bethesda, Md.

Four papers will be presented.

Afternoon, November 14

Inspection trip to the National Institutes of Health, Bethesda, Maryland.

Morning, November 15

AUDIOLOGY AND INSTRUMENTATION FOR HEARING

Chairman: Dr. Scott Reger, Department of Otolaryngology, University of Iowa Hospital, Iowa City, Iowa.

Four papers will be presented.

Afternoon, November 15

Inspection trip to Naval Medical Research Institute, Bethesda, Maryland.

Morning, November 16

INSTRUMENTATION IN MEDICINE AND BIOLOGY

Chairman: W. A. Wildhack, Chief of Office of Basic Instrumentation, National Bureau of Standards, Washington, D. C.

Six papers will be presented.

Afternoon, November 16

Inspection trip to National Bureau of Standards, Washington, D. C.

Abstracts of IRE Transactions

The following issues of "Transactions" have recently been published, and are now available from the Institute of Radio Engineers, Inc., 1 East 79th Street, New York 21, N. Y. at the following prices. The contents of each issue and, where available, abstracts of technical papers are given below.

Sponsoring Group	Publication	Group Members	IRE Members	Non-Members*
Aeronautical and Navigational Electronics	Vol. ANE-2, No. 3	$0.95	$1.45	$2.85
Audio	Vol. AU-3, No. 4	$1.15	$1.75	$3.45

*** Public libraries and colleges may purchase copies at IRE Member rates.**

Aeronautical and Navigational Electronics

Vol. ANE-2, No. 3, September, 1955

Lewis M. Hull, Pioneer in Aeronautical Electronics Award

RTCA-IRE West Coast Meeting—The Editor

What Is RTCA, Its Philosophy, and Its Relationship to IRE and Other Professional Societies?—J. H. Dellinger

Improving Air-Ground Communications—E. W. Pappenfus

Instrumentation Requirements for All-Weather Helicopter Flight—R. F. Bohling

Combining the Automatic Pilot and the Flight Director—E. H. Fritze and J. D. Rector

Aircraft Antenna System Lightning Protection—R. F. Huber, M. M. Newman, and J. D. Robb

A Miniature Airborne Pictorial Plotter—S. Romano

IRE-RTCA Symposium

Contributors in This Issue

Audio

Vol. AU-3, No. 4, July–August, 1955

PGA Comes of Age

PGA Chapter News

A Multi-Loop, Self-Balancing Power Amplifier—J.R. Macdonald

A multi-loop, push-pull power amplifier of exceptional characteristics is described. It employs special circuits to maintain accurate push-pull signal balance throughout and to hold the static or steady-state dc cathode currents of the output tubes equal. A pair of 807 tubes are used in class AB_2 to yield 65 w average power output at less than 1 per cent intermodulation distortion with 30 db of over-all negative feedback. Using local positive voltage feedback in addition, the intermodulation distortion is 0.1 per cent at 45 w and less than 0.2 per cent at 60 w. At full power output, the −0.5 db points occur at 19.8 cps and 22.4 kcps. The rise time of the amplifier is 3 μs, and its transient response and recovery from overload approach the ideal. There are no peaks at the ends of the response curve. A noise level of −106 db referred to 60 w output is attained. Extensive measurements of amplifier characteristics under various conditions are described.

Properties of Junction Transistors—R. J. Kircher

The motion of electrons and holes is considered in relation to the PN junction and it in turn is considered in relation to the junction transistor. Electrical properties, equivalent circuit diagrams, and limiting conditions of operation of junction transistors are discussed. Special equations and features of the common base, common emitter, and common collector configurations are developed and tabulated.

Low Distortion Operation of Some Miniature Dual Triodes—J. Z. Knapp

The variation of distortion with available parameters for low level rc-coupled triode stages is investigated and, the possibility of minimizing second harmonic distortion utilizing signal-source impedance and the nonlinear, noninfinite dynamic grid resistance as an amplitude-correcting device, is explored and found to warrant further consideration. Some data on distortion-level reproducibility for randomly-selected tubes is presented and the limitation of local feedback as a distortion reduction scheme is pointed out. Variation of distortion with signal level is discussed and demonstrated.

Contributors

Abstracts and References

Compiled by the Radio Research Organization of the Department of Scientific and Industrial Research, London, England, and Published by Arrangement with that Department and the *Wireless Engineer*, London, England

NOTE: The Institute of Radio Engineers does not have available copies of the publications mentioned in these pages, nor does it have reprints of the articles abstracted. Correspondence regarding these articles and requests for their procurement should be addressed to the individual publications, not to the IRE.

Acoustics and Audio Frequencies....... 1684
Antennas and Transmission Lines...... 1685
Automatic Computers................. 1685
Circuits and Circuit Elements.......... 1686
General Physics..................... 1688
Geophysical and Extraterrestrial Phenomena.......................... 1689
Location and Aids to Navigation....... 1691
Materials and Subsidiary Techniques... 1691
Mathematics........................ 1694
Measurements and Test Gear......... 1694
Other Applications of Radio and Electronics............................ 1695
Propagation of Waves................ 1695
Reception.......................... 1696
Stations and Communication Systems... 1696
Subsidiary Apparatus................. 1697
Television and Phototelegraphy........ 1697
Tubes and Thermionics............... 1697
Miscellaneous....................... 1698

The number in heavy type at the upper left of each Abstract is its Universal Decimal Classification number and is not to be confused with the Decimal Classification used by the United States National Bureau of Standards. The number in heavy type at the top right is the serial number of the Abstract. DC numbers marked with a dagger (†) must be regarded as provisional.

The Index to the Abstracts and References published in the PROC. IRE from February, 1954 through January, 1955 is published by the PROC. IRE, April, 1955, Part II. It is also published by *Wireless Engineer* and included in the March, 1955 issue of that journal. Included with the Index is a selected list of journals scanned for abstracting with publishers' addresses.

ACOUSTICS AND AUDIO FREQUENCIES

534.2–8 2809

Absorption and Velocity of Ultrasonic Waves of Finite Amplitude in Liquids—D. M. Towle and R. B. Lindsay. (*Jour. Acous. Soc. Amer.*, vol. 27, pp. 530–533; May, 1955.) Measurements have been made of the absorption and velocity as a function of the intensity. Results are reported for propagation in distilled water and dilute solutions of acetic acid and sodium acetate and for glycerine, using frequencies from 4 to 9 mc. Absorption was observed to vary but velocity remained unchanged.

534.2–8 2810

Phase Velocity and Absorption Measurements in Water containing Air Bubbles—F. E. Fox, S. R. Curley and G. S. Larson. (*Jour. Acous. Soc. Amer.*, vol. 27, pp. 534–539; May, 1955.) Measurements were made of the phase velocity and absorption at frequencies from 10 kc to 1 mc. Phase velocity varied from 500 m/s to 2,500 m/s and peak absorption was >30 db/cm with the bubbles constituting 0.02 per cent of the volume.

534.2–8 2811

Attenuation of Ultrasound in Aqueous Suspensions—V. J. Stakutis, R. W. Morse, M. Dill and R. T. Beyer. (*Jour. Acous. Soc. Amer.*, vol. 27, pp. 539–546; May, 1955.) Measurements were made using ultrasonic pulses of frequency between 15 and 30 mc in suspensions of lycopodium spores and of a quartz sand at various concentrations. The attenuation constant varies linearly with the concentration over the range investigated.

534.232+538.566 2812

Relation between the Intensity Distributions over Radiating Systems and their Directivity Characteristics—Eckart. (See 2923.)

534.232–8 2813

Design of Large Variable Resonant Frequency Transducers—F. J. Fry, F. Dunn and W. J. Fry. (*Jour. Acous. Soc. Amer.*, vol. 27, pp. 570–575; May, 1955.) A transducer is described comprising a plane array of piezoelectric elements coupled to a mercury column of variable length. The system is enclosed in a steel tank with a rubber window for underwater use; it is capable of providing high acoustic power over a wide frequency range. See also 2319 of 1951 (Hall and Fry).

534.24:551.596.1 2814

Echoes in Forests—N. V. Ivashchenko. (*Priroda, Moscow*, vol. 44, pp. 117–118; March, 1955.) The duct effect and sound echoes observed in woods are probably due to reflections at a layer of warmer air above and around the wood; such a layer would be produced by the sun, in the absence of high winds.

534.414 2815

Theory of Arbitrary Systems of Weakly Coupled Acoustic Resonators—E. Christian (*Acustica*, vol. 5, pp. 119–130; 1955. In German.) First-order perturbation theory is used. The frequency splitting caused by volume deformation is calculated as well as that resulting from detuning due to the coupling spaces. The coupling frequencies are found as solutions of a secular determinant whose elements are composed of energy terms.

534.61:534.79 2816

Testing and Calibration of Commercial Phonmeters with Particular Reference to Measurements of Traffic Noise—S. Kitsopoulos. (*Bull. Schweiz. elektrotech. Ver.*, vol. 46, pp. 372–376, 389; April 16, 1955.)

534.614–8 2817

Dispersion of Ultrasonic Pulse Velocity in Cylindrical Rods—L. Y. Tu, J. N. Brennan and J. A. Sauer. (*Jour. Acous. Soc. Amer.*, vol. 27, pp. 550–555; May, 1955.) Measurements were made of the velocity of compression and shear waves in rods of Al alloy, brass, Cu and steel with diameters from 1/8 to 1 inch, using pulses with carrier frequencies of 200, 400, 1,000 and 2,500 kc. With compression waves the velocity depends on the ratio between rod radius a and λ, its value practically reaching that appropriate to the bulk material when $a/\lambda = 2.5$. No such dispersion is observed with shear waves.

534.75 2818

The Reception of Repeated and Overlapping Speech Patterns—J. W. Black. (*Jour. Acous. Soc. Amer.*, vol. 27, pp. 494–496; May, 1955.) Experiments are reported on the effect on intelligibility of presenting speech syllables almost simultaneously via a direct channel and via a variable-delay channel. With the delay varied by 0.03-sec steps up to 0.33 sec, intelligibility was in all cases lower than for the direct signal alone.

534.75 2819

Statistical Study of Differential Auditory Sensitivity in relation to Intensity—R. Chocholle. (*Acustica*, vol. 5, pp. 134–141; 1955. In French.)

534.78 2820

Development of a Quantitative Description of Vowel Articulation—K. N. Stevens and A. S. House. (*Jour. Acous. Soc. Amer.*, vol. 27, pp. 484–493; May, 1955.)

534.78:534.4 2821

A Difference Limen for Vowel Formant Frequency—J. L. Flanagan. (*Jour. Acous. Soc. Amer.*, vol. 27, pp. 613–617; May, 1955.)

534.851:681.85 2822

Calibration of Test Records by Interference Patterns—B. B. Bauer. (*J. acoust. Soc. Amer.*, vol. 27, pp. 586–594, May, 1955.)

534.86:621.395.625.3:621.318.13 2823

Alloy improves Magnetic Recording—C. W. Lufcy and W. T. Heath. (*Electronics*, vol. 28, pp. 137–139; June, 1955.) Recording and reproducing heads made from cold-rolled alfenol [2456 of 1954 (Nachman and Buehler)] have been investigated; they have high wear resistance and resolution and low losses, all important advantages for handling video signals.

534.862.4:621.395.625.3 2824

Survey of Flux-Responsive Magnetic Reproducing Heads—O. Kornei. (*Jour. Acous. Soc. Amer.*, vol. 27, pp. 575–580; May, 1955.)

621.395.623.743 2825

Wide-Range Electrostatic Loudspeakers—P. J. Walker. (*Wireless World*, vol. 61, pp. 208–211, 265–269, 381–384; May/June/August, 1955. Correction, *ibid.*, vol. 61, p. 346; July, 1955.) By reducing the acoustical efficiency of the es loudspeaker to a level comparable with that of moving-coil loudspeakers it is possible to obtain linear response over 4–5 octaves anywhere in the audible range. Methods of coupling the diaphragm to the air are discussed and compared with moving-coil practice. The advantages of a strip diaphragm of length great compared with $\lambda/3$ at the lowest frequency to be reproduced, and width small compared with λ at the highest frequency, are enumerated. The acoustical problem is discussed with reference to equivalent networks. Efficiency in converting electrical power into sound is best achieved by the use of several units each covering a restricted bandwidth (>2 octaves) and fed through crossover networks. The acoustical relations between the loudspeaker and the room in which it is used are discussed; the characteristics of small corner-mounted diaphragms are compared with those of large diaphragms radiating on both sides

621.395.625.2+621.395.616 2826

Capacitive Transducer has Low Impedance—H. P. Kalmus. (*Electronics*, vol. 28, pp. 161–163; June, 1955.) A peak-rectifier circuit is used with the transducer, comprising a pair of metal plates and a stylus between them, arranged in series with the rectifier diode. For typical stated operating conditions the device is equivalent to an audio generator with open-circuit voltage of 250 mv and internal impedance 5 kΩ. Use of the principle in the design of a gramophone pickup and a capacitor microphone is discussed briefly.

ANTENNAS AND TRANSMISSION LINES

621.315.212 2827

Investigation of a Production Length of Cable by Terminal-Impedance Measurements—M. Cotte. (*Câbles & Transm.*, vol. 9, pp. 161–171; April, 1955.) Local impedance variations of coaxial cable are determined by constructing a Fourier series based on terminal-impedance measurements. Both negligible and appreciable line attenuations are considered. The results agree well with those obtained by other methods.

621.315.212+621.372.8]:621.317.3 2828

Measurement of Weak Reflections in Coaxial-Line and Waveguide Systems—Epprecht and Stäger. (See 3037.)

621.372 2829

Propagation of a Fundamental Wave between Parallel Surfaces—E. Burshtein and L. Solov'ev. (*C.R. Acad. Sci. U.R.S.S.*, vol. 101, pp. 465–468; March 21, 1955. In Russian.) The fundamental wave is considered to be one which, in the limiting case of plane boundary surfaces, becomes a homogeneous plane wave. The phase velocity midway between the boundary surfaces, which may be slightly curved, is calculated and the phase distribution on the midway surface and the normals to the lines of constant phase; i.e., the wave "rays," are hence determined.

621.372.2 2830

The Uniform-Structure Electromagnetic Delay Line—P. M. Prache. (*Câbles & Transm.*, vol. 9, pp. 112–143; April, 1955.) Complete theory of a system constituted by a copper coil wound on a cylindrical insulating former and connected to a straight return wire through uniformly distributed capacitances. Calculated values of delay, characteristic impedance and attenuation for both screened and unscreened lines are in good agreement with experimental results. Optimum dimensions for obtaining given characteristics are deduced.

621.372.2:517 2831

The Electromagnetic Delay Line, Source of Relations between Bessel Functions and Elliptic Integrals—P. M. Prache. (*Ann. Télécommun.*, vol. 10, pp. 82–86; April, 1955.) Expressions for the delay-line vector magnetic potential and field are derived in terms of Bessel functions and quoted from standard electromagnetic theory in terms of elliptical integrals. By comparing the two sets of expressions, infinite integrals of products of Bessel functions can be reduced to elliptic integrals which can be calculated easily from tables.

621.372.8 2832

On the Theory of Circularly Symmetric TM Waves in Infinite Iris-Loaded Guides—C. C. Grosjean. (*Nuovo Cim.*, vol. 1, pp. 427–438; March 1, 1955. In English.) Exact theory is developed, making use of the Floquet theorem. The final equations form an infinite linear system which can be transformed in several ways to derive new formulas, but which has not yet been solved explicitly.

621.372.8 2833

Mathematical Transformation of a System of Equations appearing in the Theory of TM Wave Propagation in Corrugated Guides—C. C. Grosjean. (*Nuovo Cim.*, vol. 1, pp. 439–446; March 1, 1955. In English.)

621.372.8 2834

On the (β_0, k) Diagrams for Circularly Symmetric TM Waves in Infinite Iris-Loaded Waveguides—V. J. Vanhuyse. (*Nuovo Cim.*, vol. 1, pp. 447–452; March 1, 1955. In English.) For the case of infinitely thin irises, the equations derived by Grosjean (2833 above) are simplified to give results directly related to the pass bands in the frequency/propagation-constant characteristics.

621.372.8 2835

Calculations for Ridge Waveguides—H. G. Unger. (*Arch. elekt. Übertragung*, vol. 9, pp. 157–161; April, 1955.) Design formulas are derived for ridge waveguides of arbitrary cross section. Numerical examples are discussed. Results are compared with calculations for given cross sections made by other workers.

621.372.8 2836

On the Proper Frequencies of Terminated Corrugated Waveguides—V. J. Vanhuyse. (*Physica*, vol. 21, pp. 269–280; April, 1955; ibid., vol. 32, p. 603; July, 1955.) Starting from Maxwell's equations, analysis is given for circularly symmetrical TM waves propagated in an iris-loaded guide terminated at each end by a half-length section. The theory is extended to cases where the diameters of the sections are not all equal. Measurements were made on waveguides with one, three and five whole sections plus the terminating half-sections; the results are in good agreement with those predicted by theory.

621.396.67 2837

Radiation from Aerials—G. Barzilai. (*Wireless Engr.*, vol. 32, pp. 223–225; August, 1955; Correction, ibid., vol. 32, p. 258; September, 1955.) "A formal expression for the complex power radiated by a thin, centre-driven aerial is derived in terms of the vector potential on the surface of the conductor, making no assumption on the distribution of current. A similar expression is then obtained for the complex power radiated by the same aerial, on the assumption of sinusoidal-current distribution. By letting the radius of the conductor approach zero, the asymptotic forms of the two aforesaid expressions are compared."

621.396.67 2838

Multipoles and Asymmetrical Schelkunoff Waves—L. Ferrari. (*R.C. Acad. naz. Lincei*, vol. 18, pp. 304–308; March, 1955.) Extension of analysis presented previously (27 of January).

621.396.676.029.53 2839

How to design Sailboat Antennas—E. Robberson. (*Electronics*, vol. 28, pp. 140–143; June, 1955.) The special problems relating to the design of mf antennas for use on vessels with an extensive superstructure are discussed.

621.396.677.029.64 2840

Study of Multiple-Horn Aerials—J. Salomon and B. Brunet. (*Rev. tech. Comp. franç. Thomson-Houston*, no. 19, pp. 75–100; April, 1955.) Theoretical and experimental investigations are reported of parabolic reflectors fed by several primary radiators. The advantages and limitations of defocusing are discussed. Various coupling arrangements of the primary radiators are considered. See also 2841 below.

621.396.677.029.64:621.396.96 2841

Design and Construction of Radar Aerials for the 10-cm Band—P. E. Vincelet. (*Rev. tech. Comp. franç. Thomson-Houston*, No. 19, pp. 59–74; April, 1955.) Design problems are considered in relation to the radiation pattern required; range, gain, number of radiating elements and reflector dimensions are considered. The characteristics of the rotating joints are discussed. Details are given of an antenna with five pyramidal horns; test methods are indicated.

621.396.677.3 2842

Optimum Design of Directive Antenna Arrays Subject to Random Variations—E. N. Gilbert and S. P. Morgan. (*Bell Syst. Tech. Jour.*, vol. 34, pp. 637–663; May, 1955.) A statistical expression is derived for the radiation pattern of an arbitrary array with random variations of the position and excitation of the elements. When the element positions are either fixed or subject to displacements with a spherically symmetrical distribution, the pattern is given by that of the undisturbed array together with a "background" component having the same directivity as the pattern of a single element. The design of superdirective arrays is discussed with emphasis on the need to maintain this background component constant while maximizing the gain of the array. Numerical examples are given.

621.396.677.3:523.16:53.088.22 2843

Correcting for Gaussian Aerial Smoothing—R. N. Bracewell. (*Aust. J. Phys.*, vol. 8, pp. 54–60; March, 1955.) If the values established in a two-dimensional radio-astronomy survey with a Gaussian antenna beam are at intervals of $\sqrt{2}$ standard deviations, then the correction for antenna smoothing is simply calculated as the difference between the value to be corrected and the mean of the neighboring four values.

621.396.677.31 2844

The Effect of the Source Distribution on Antenna Patterns—S. Matt and J. D. Kraus. (Proc. IRE, vol. 43, pp. 821–825; July, 1955.) An examination is made of the effect on the observed polar diagram of a receiving antenna of appreciable extension of the radiation source. The problem is discussed in relation to the Ohio State University radiotelescope antenna, which comprises 96 helical antennas in a broadside array of length about 40λ and width about 5.6 λ when operating at a frequency of 250 mc. The extension of sources is deduced approximately from observed patterns; an analytical method of determining source extension is also discussed.

AUTOMATIC COMPUTERS

681.142 2845

Electronic Computers for the Businessman—J. M. Carroll. (*Electronics*, vol. 28, pp. 122–131; June, 1955.) A survey covering 38 commercially available digital computers. Important characteristics are tabulated.

681.142 2846

Storage Devices for High Speed Calculators—A. D. Booth. (*Research*, (*London*), vol. 8, pp. 130–140; April, 1955.) A survey covering thermal, optical, sonic-delay, electrochemical, cr tube, ferroelectric, capacitor, magnetic-drum, magnetostriction and magnetic-core devices.

681.142 2847

A Proposed Modification to the C.S.I.R.O. Mark I Computer—B. E. Swire. (*Aust. J. Phys.*, vol. 8, pp. 184–186; March, 1955.) The suggestion is put forward that a facility be built into the machine for distinguishing between machine commands and interpretive or "hyper" commands so that the former are performed directly while on receipt of one of the latter control is directed to the head of the interpretation routine with simultaneous storage of the link datum to enable return of control to the next program command after performance of the hyperfunction. This would result in a considerable gain in speed. See also 640 and 641 of 1954 (Pearcey and Hill).

681.142:511.142 2848

Automatic Square Rooting—E. H. Lenaerts. (*Electronic Engng.*, vol. 27, pp. 287–289; July, 1955.) A computation method is described, with examples, and an indication is given of the type of additional circuit required in computers of the LEO type [3473 of 1954 (Pinkerton *et al.*)]. The square root of a 40-digit number is obtained in 6.4 ms.

681.142:538.221 2849

Multiple-Coincidence Magnetic Storage Systems—R. C. Minnick and R. L. Ashenhurst. (*Jour. Appl. Phys.*, vol. 26, pp. 575–579; May, 1955.) "In existing magnetic matrix storage systems a given location is selected by applying to two intersecting wires a current equivalent to one-half of the selecting field. This situation is generalized so that any core is selected by energizing p wires each with a current equivalent to $1/p$ of the selecting field. The advantages gained are in the correspondingly smaller fields applied to the nonselected cores, or alternatively, in the faster switching times obtainable by applying a total field greater than the coercive force to the selected core . . . Specifically, a storage matrix is illustrated in which the cores are toroids etched from a continuous sheet of magnetic material."

681.142:621.384.622 2850

A Computer for solving some Problems in connection with Travelling-Wave Particle Accelerators—Crowley-Milling. (See 3061.)

681.142.002.2 2851

Digital Computer Plug-In Units and Associated Equipment—J. N. Harris and F. L. McNamara. (*Elect. Engng, N. Y.*, vol. 74, pp. 326–329; April, 1955.) Basic circuits etched on small boards are plugged into standard 32-contact receptacles, 15 of which are combined in a sub-rack assembly complete with power wiring.

CIRCUITS AND CIRCUIT ELEMENTS

621.3.018.7 2852

The Unit Step, the Unit Pulse, and the Dirac Operator—R. Cazenave. (*Ann. Télécommun.*, vol. 10, pp. 50–53; March, 1955.) The unit pulse is identified as the derivative of the unit step, and the identity between the unit pulse and the Dirac function is demonstrated by considering the establishment of a direct current in a circuit with finite inductance but vanishing capacitance.

621.3.049.75 2853

"Stamping" Metals by Etching—A. Coleman. (*Mater. & Meth.*, vol. 41, pp. 96–97; March, 1955.) The process briefly described consists of printing the pattern of the desired circuit or part on a flat metal sheet or strip with an acid-resistant ink and then etching away the unprotected metal. The printing can be performed by a photographic, lithographic or silk-screen process.

621.316.8:621.396.828 2854

Resistors for Radio-Interference Suppression in Otto-Cycle [internal-combustion] Engines—Henniger. (See 3083.)

621.318.57:621.314.7 2855

Directly Coupled Transistor Circuits—R. H. Beter, W. E. Bradley, R. B. Brown, and M. Rubinoff. (*Electronics*, vol. 28, pp. 132–136; June, 1955.) Switching circuits using surface-barrier and alloy-junction transistors are described. In many cases the only other circuit components required are resistors. Rise and fall times of about $0.08\ \mu s$ and $0.10\ \mu s$ respectively are obtained. Applications in digital computers are mentioned.

621.372 2856

Further Analysis of Transmission-Line Directional Couplers—R. C. Knechtli. (PROC. IRE, vol. 43, pp. 867–869; July, 1955.) The conditions for infinite directivity in transmission line directional couplers derived by Firestone (49 of January) are discussed; more general conditions are derived valid for any degree of coupling.

621.372.412:549.514.51 2857

Frequency Aging of High-Frequency Plated Crystal Units—A. W. Warner. (PROC. IRE, vol. 43, pp. 790–792; July, 1955.) The aging process is discussed in terms of contamination of the quartz crystal; the influence of various production methods is examined. Data obtained with units in metal and glass enclosures are presented graphically.

621.372.412:549.514.51 2858

The Effect of Temperature and Acoustic Impedance of Vapours on the Electrical Constants of Quartz—S. Parthasarathy and V. Narasimhan. (*Ann. Phys., Lpz.*, vol. 15, pp. 302–310; March 15, 1955. In English.) Measurements were made of the equivalent resistance of a crystal vibrating in vapors of various organic liquids. At a given temperature, the equivalent resistance depends on the pressure. As the temperature increases the equivalent resistance decreases, the rate of decrease depending on the particular vapor.

621.372.413 2859

Tunable Temperature-Compensated Reference Cavity—M. S. Wheeler. (*Wireless Engr.*, vol. 32, pp. 201–205; August, 1955.) A design is discussed based on separation of the tuning and temperature-compensation functions. Temperature compensation at fixed frequency is discussed first and the conditions for variable frequency are then deduced. Experiments indicate that a cavity with a double-nosed construction can be made satisfying the theoretical requirements over a 5 per cent or 10 per cent band. Analysis is presented with reference to an equivalent circuit.

621.372.5 2860

Active-Ladder-Network Analysis—H. D. Polishuk. (*Wireless Engr.*, vol. 32, pp. 215–220; August, 1955.) A computationally economical method is developed in which the voltage appearing across the final "rung" of the ladder is expressed as a function of the individual randomly distributed sources of emf by a reduction process involving successive applications of Thévenin's theorem to all the meshes. The method is illustrated by examples.

621.372.5 2861

Representation of the General Linear Four-Terminal Network and some of its Properties—C. G. Aurell. (*Ericsson Tech.*, vol. 11, pp. 155–179; 1955.) Nonreciprocal networks are considered. Equations are formulated in terms of power and impedance. A method of representation is developed based on introduction of a circuit element called the "antireciprocal transition" in series with a reciprocal network. Power attenuation and matching are investigated. A new criterion for classifying networks as passive or active is proposed. A grounded-emitter transistor amplifier is discussed as a particular application of the theory.

621.372.5 2862

The Design of Quadripoles—M. Skalicky. (*Elektrotech. u. Maschinenb.*, vol. 72, pp. 173–174; April 15, 1955.) In the case of symmetrical quadripoles, by writing $\sqrt{K/L}=p$ and $\sqrt{KL}=Z$, where K and L are the impedance parameters defined earlier (3030 of 1952), general expressions are derived by a matrix treatment for the current and voltage in a ladder network, in which the characteristic-impedance term Z occurs only in the first degree.

621.372.5 2863

Synthesis of Passive Quadripoles—F. Hott. (*Rev. gén. Élect.*, vol. 64, pp. 203–205; April, 1955.) It is shown that any passive quadripole can be constituted by combining a two-terminal network with a T or Π network, the whole comprising four two-terminal physically realizable networks with complex impedance.

621.372.5 2864

A New Method for investigating Linear Quadripoles—J. de Buhr. (*Fernmeldetech. Z.*, vol. 8, pp. 200–204; April, 1955.) A treatment based on representation of impedance transformations by displacements on the surface of a sphere; known graphical methods are made accessible to a purely geometric treatment by the method of projection. Problems of networks satisfying Kirchhoff's laws can be solved with compasses and ruler.

621.372.5 2865

Impossible Behavior of Nonlinear Networks—R. J. Duffin. (*Jour. Appl. Phys.*, vol. 26, pp. 603–605; May, 1955.) The following proposition is discussed: "An isothermal electromechanical system whose primary resistors are quasi-linear cannot convert direct current to alternating current." A resistor is said to be quasi-linear if the voltage drop across it is a function only of the current, and if the differential resistance is positive.

621.372.5 2866

Note on the Kramers-Kronig Relations—M. K. Brachman. (*Jour. Appl. Phys.*, vol. 26, pp. 497–498; May, 1955.) "The explicit form of the relationship between the real and imaginary parts of a physically realizable network function is correlated with the alternate conventions available for such problems. The transformation from a linear frequency scale to a logarithmic one is simply effected by considering the Mellin transforms of the appropriate functions."

621.372.5:621.375.13 2867

Some Gyrator and Impedance Inverter Circuits—B. P. Bogert. (PROC. IRE, vol. 43, pp. 793–796; July, 1955.) The design of feedback amplifiers to provide impedance inversion is considered. Negative-impedance elements may be included to compensate for the residual impedances in the inverter; when this is done the circuit exhibits gyrator properties. Measurements on a high-stability amplifier with a series resistance of $-600\,\Omega$ in the input lead indicated that accurate impedance inversion was obtained for load resistances from 40 Ω to 4,000 Ω.

621.372.5:621.396.822 2868

Nyquist's and Thevenin's Theorems generalized for Nonreciprocal Linear Networks—R. Q. Twiss. (*Jour. Appl. Phys.*, vol. 26, pp. 599–602; May, 1955.) Theory of nonreciprocal networks such as those including ferrites is developed taking account of internal noise sources. The system can be treated as the combination of a source-free network together with a set of correlated noise-current or noise-voltage generators. Modifications of the treatment are indicated for dealing with cases where the actual noise sources are at different temperatures, as in the problem of determining the noise correlation between two receiver channels connected to a gyrator fed by two coupled antennas.

621.372.5.012 2869

Determination of the Frequency and Phase Characteristics of a Network for a Given Attenuation Curve—H. Kaufmann. (*Arch. elekt. Übertragung*, vol. 9, pp. 192–198; April, 1955.) A modification of the graphical method developed by Baum (3040 of 1948) is described for deriving a realizable attenuation characteristic approximating to the given one.

621.372.54 2870

A Derivation Method for designing Two- and Three-Element Filter Structures—J. E. Colin. (*Câbles & Transm.*, vol. 9, pp. 81–111; April, 1955.) A summary of fundamental principles with specific examples of two- and three-element designs using loss-free elements with no mutual inductance. The H, N and associative derivations, and an extension of Zobel's *m* derivation are treated, also the *LC* dederivation involving interchange of *L* and *C*. Application of Norton's transformation is illustrated.

621.372.542.21:621.396.822 2871

The Noise-Power Bandwidths of Iterated Low-Pass *RC* Filters—W. E. Smith. (*Aust. J. appl. Sci.*, vol. 6, pp. 7–12; March, 1955.) "The noise-power bandwidths of *n*-section low-pass *RC* filters are calculated exactly from the transfer function for $n=1$ to 6. An asymptotic expression is derived for the bandwidth when the number of sections is large, and then the bandwidth is inversely proportional to n^2."

621.373.4 2872

The Periodic Solutions of a Nonlinear Differential Equation of the Second Order with Unsymmetrical Non-Linear Damping, and a Forcing Term—A. W. Gillies. (*Quart. J. Mech. appl. Math.*, vol. 8, pp. 107–128; March, 1955.) The differential equation considered gives a closer approximation to the behavior of tube oscillators than the van der Pol equation, and demonstrates the frequency deviation associated with the presence of higher harmonics.

621.373.42:621.385.029.64:621.316.726 2873

Study of the Relative Frequency Fluctuations of Two Reflex Klystrons stabilized by Different Methods—L. Jampierre. (*Ann. Télécommun.*, vol. 10, pp. 65–78, 87–99; March /April, 1955.) In connection with projected experiments of the Michelson type, it was desired to ascertain whether a variation of 0.08 c/s due to modulation could be detected in the frequency of 10-kmc oscillations modulated at 0.5 c/s. A study was made of the inherent frequency fluctuations of klystron oscillators and of methods for limiting them, with particular reference to the stabilization of supply sources. Alternative electronic methods involving use of waveguides and cavity resonators were used to stabilize the frequency of the beat between the two klystron oscillations, one of which was modulated. Filters of bandwidth 0.5 c/s were used to improve this stability. Results are compared with those of Pound (1311 of 1948) and Essen (1085 of 1953); they indicate that it should be possible with present-day techniques to detect a frequency variation of the order of 1 part in 10^{11}.

621.373.42.029.64 2874

Phase Stabilization of Microwave Oscillators—M. Peter and M. W. P. Strandberg. (Proc. IRE, vol. 43, pp. 869–873; July, 1955.) Description of a circuit incorporating a single stable feedback loop, that has been used to stabilize the frequency of a Type-2K50 K-band klystron by locking it to a harmonic of a quartz-controlled oscillator. Any phase modulation in the klystron is detected in a phase discriminator, the resulting signal is amplified in a differential dc amplifier and applied to the klystron repeller electrode.

621.373.421.1:621.396.822 2875

Phase Fluctuations in a Valve Generator—I. S. Gonorovski. (*C. R. Acad. Sci. U.R.S.S.*, vol. 101, pp. 657–660; April 1, 1955. In Russian.) The effect of shot noise on an oscillator operating in the steady state is considered theoretically. The intensity and the statistical properties of the shot current are independent of the feedback circuit and can thus be represented by a separate noise-current generator in parallel with the oscillator; analysis is presented on the basis of such an equivalent circuit.

621.373.421.11 2876

Frequency Stable *LC* Oscillators—W. B. Bernard and J. K. Clapp. (Proc. IRE, vol. 43, pp. 875–876; July, 1955.) Critical comment on 3170 of 1954 and author's reply.

621.373.431.1 2877

Analysis of the Relaxation Period of a Multivibrator—D. C. Sarkar and R. Ahmed. (*Indian J. Phys.*, vol. 28, pp. 533–541; November, 1954.) The analysis takes account of positive grid swing and appreciable shunting capacitance. Comparison of values obtained from the theory with experimental results indicates that the method is satisfactory.

621.373.431.1:621.314.63 2878

A Semiconductor Diode Multivibrator—J. J. Suran and E. Keonjian. (Proc. IRE, vol. 43, pp. 814–820; July, 1955.) A circuit is described using one double-base diode [see e.g. 2535 of 1954 (Aldrich and Lesk)] together with one ordinary diode and only three resistors and one capacitor.

621.373.432 2879

Significance of the Mandelstam Condition in the Oscillations of a Neon Lamp—P. Jean. (*C. R. Acad. Sci.*, (*Paris*), vol. 240, pp. 2059–2061; May 23, 1955.) Theory presented previously (3502 of 1954) is generalized. For relaxation oscillations to occur, three conditions must be satisfied simultaneously, including the Mandelstam condition which requires that the energy of the system shall remain constant at the discontinuity. This condition can be satisfied using a *RC* circuit, but not using a *RL* circuit.

621.373.52 2880

Isocline Diagrams for Transistor Circuits—F. Oakes. (*Electronic Engng.*, vol. 27, pp. 312–317; July, 1955.) "The method described for the graphical analysis of transistor negative resistance oscillators is based on non-linear mechanics, and does not necessitate approximation of curved transistor characteristics by straight lines. Voltage and current trajectories can be obtained by a simple construction which also indicates the rate of change of the voltages and currents during the course of cyclic or transient phenomena."

621.374.32:621.318.57 2881

Nonsaturating Pulse Circuits using Two Junction Transistors—J. G. Linvill. (Proc. IRE, vol. 43, pp. 826–834; July, 1955.) Junction transistors are found to be fast enough for pulse applications if the collector voltage is prevented from reaching zero. Switching times <1 μs can be achieved with available types. The required limiting action is effected by introducing diodes which terminate the switching transients by their breakdown. A two-transistor binary counter is described.

621.374.4 2882

A Decade Frequency Divider—R. B. Mobsby. (*Electronic Engng.*, vol. 27, pp. 295–298; July, 1955.) A divider developed for use with a quartz-crystal clock consists basically of a chain of Eccles-Jordan binary pairs whose over-all division ratio has been reduced by means of feedback. A complete circuit diagram is given.

621.375.2.024 2883

Method of reducing Zero Error and Drift in Breaker Type D.C. Amplifiers—T. M. Dauphinee. (*Rev. sci. Instrum.*, vol. 26, pp. 401–402; April, 1955.) Thermal emf's in the input transformer are cancelled by using a double-pole double-throw input chopper and connecting a high-quality capacitor in series with the winding.

621.375.2.029.4 2884

Low-Frequency Decoupling of Cathode and Screen Grid of an Amplifier Valve—R. Dessoulavy. (*Tech. Mitt. schweiz. Telegr.-Teleph. Verw.*, vol. 33, pp. 137–143; April 1, 1955. In French.) A method is described for using the Smith chart to determine the falling off at the upper and lower ends of the af response curve due to the decoupling capacitors.

621.375.221 2885

Distortion and Power in Aperiodic Amplifiers using Ideal Screen-Grid Valves—P. Schiaffino. (*Ricerca sci.*, vol. 25, pp. 896–921; April, 1955.) Calculations are made for Class A, AB, B and C operation, assuming a parabolic or nearly parabolic tube characteristic. A determination is made of the input waveform required to give a pure sinusoidal output. The effect of negative feedback is studied. Operation with sawtooth or square pulses is discussed.

621.375.221.2 2886

The Band-Pass Distributed Amplifier—V. C. Rideout and T. P. Tung. (*J. Indian Inst., Sci.*, Section B, vol. 37, pp. 138–161; April, 1955.) General expressions are derived for the gain of a distributed amplifier with any number of tubes coupled by identical filter sections. The analysis indicates that reduction of band-edge peaks is more difficult for band-pass than for low-pass amplifiers. Choice of suitable filter networks for the band-pass case is discussed, and some experimental results are presented for a 4-tube amplifier with a pass band from 51 mc to 81.8 mc.

621.375.223 2887

Design of Wide-Band *RC* Amplifiers—E. Schuon. (*Fernmeldetech. Z.*, vol. 8, pp. 233–239; April, 1955.) Discussion of multistage amplifier with inductive equalization in the anode circuit. The effect of negative feedback in the cathode line is examined.

621.375.232.3 2888

Active-Error Feedback and its Application to a Specific Driver Circuit—J. R. Macdonald. (Proc. IRE, vol. 43, pp. 808–813; July, 1955.) Feedback amplifiers are discussed in which the feedback signal is nominally equal to the input; the difference, which is proportional to the distortion or error in the output, is amplified in a separate circuit and re-injected with the proper polarity to reduce the output error. Analysis is given for a cathode-follower circuit incorporating this principle; the arrangement is especially suitable for driving the grid of an output tube highly positive. Experimental results support the theory.

621.375.4+621.373.52+621.318.57]:621.314.7 2889

The Transistor: Part 6—Applications—H. G. Bassett. (*P.O. elect. Engrs' J.*, vol. 48, pp. 47–52; April, 1955.) Amplifier, oscillator and switching circuits are discussed. Part 5: 3109 below.

621.375.4:621.314.7 2890

Linear Properties of the Transistor—G. Ledig. (*Fernmeldetech. Z.*, vol. 8, pp. 221–228; April, 1955.) Formulas and charts for various transistor circuits are presented.

621.375.4:621.314.7 2891

Internal Feedback and Neutralization of Transistor Amplifiers—A. P. Stern, C. A.

Aldridge, and W. F. Chow. (Proc. IRE, vol. 43, pp. 838–847; July, 1955.)

621.375.43:621.314.7 2892

Tensor Analysis of Transistor Feedback Circuits—G. Ledig. (*Arch. elekt. Übertragung*, vol. 9, pp. 162–167; April, 1955.) Theory is presented for the grounded-base circuit. The coefficients of the impedance matrix for the back-coupled circuit are obtained by multiplying those for the original circuit by certain characteristic tensors derived from the relation between the currents in the original and in the back-coupled arrangements. Particular conditions examined include current feedback, positive and negative voltage feedback, and other arrangements involving two feedback paths. Applicability of the duality principle is discussed.

621.376.3:621.317.39 2893

A Linear Capacitance-Change Circuit—V. H. Attree. (*Electronic Engng.*, vol. 27, pp. 308–310; July, 1955.) Capacitance changes produced by mechanical displacement modulate the frequency of a 465-kc Franklin oscillator which drives a nonode fm discriminator. Sensitivity is 10 V/pF, and the output is linear between −40 and +40 V. About 30 references are given to measurements of mechanical and other quantities by means of a capacitance change.

621.376.32:621.314.63 2894

Crystal Diodes in Voltage Dividers, in particular for increasing the Linearity and Slope of Static and Dynamic Characteristics—H. Meinke and A. Rihaczek. (*Fernmeldetech. Z.*, vol. 8, pp. 273–276; May, 1955.) Hf voltage dividers are discussed comprising a diode in series with a passive element, the voltage division ratio being varied by suitably controlling the diode. Applications to reactance-tube fm circuits are described.

621.375.4.029.3:621.314.7 2895

Transistor Audio Amplifiers [Book Review]—R. F. Shea. Publishers: Chapman and Hall, London, 52 s. (*Wireless Engr.*, vol. 32, p. 226; August, 1955.) Only junction transistors are considered.

GENERAL PHYSICS

53.087/.088 2896

Sharpening of Observational Data in Two Dimensions—E. J. Burr. (*Aust. J. Phys.*, vol. 8, pp. 30–53; March, 1955.) The problem considered is that of recovering true distributions from smoothed observed distributions; this involves the solution of a linear integral equation. Several methods of solving the equation are examined and a technique for the application of polynomial solutions is presented. The effect of random errors in the observational data is taken into account wherever possible.

534.015.1 2897

Representation of the Modes of Motion of an Undamped Linear Oscillating System with Two Degrees of Freedom—K. Auch and W. Braunbek. (*Ann. Phys., Lpz.*, vol. 15, pp. 255–267; March 15, 1955.) The general solution of the differential equations for a system comprising two coupled mass-points corresponds to the superposition of two natural oscillations, but a better idea of the phenomenon is obtained by considering the motion as a single oscillation modulated in phase and in amplitude. This approach is illustrated graphically.

535.376 2898

Polarization Effects on the Brightness Waves of Electroluminescence—F. Matossi. (*Phys. Rev.*, vol. 98, pp. 434–437; April 15, 1955.) The observed cyclical variation of brightness of electroluminescent systems excited by sinusoidal fields is shown to be related to polarization effects of the type discussed e.g. by Jaffé (2193 of 1952) in connection with semi-conductors.

535.377 2899

Theory of Thermoluminescence—Ch. B. Lushchik. (*C. R. Acad. Sci. U.R.S.S.*, vol. 101, pp. 641–644; April 1, 1955. In Russian.)

535.514:538.61 2900

Polarization of Light by Aspherical Ferromagnetic Particles in a Uniform Magnetic Field: Part 1—Experimental Investigations with a γ-Fe_2O_3 Smoke. Part 2—Theory—E. Fick. (*Z. Phys.*, vol. 138, pp. 183–189; July 10, 1954. vol. 140, pp. 308–339; March 21, 1955.)

537.122:530.145 2901

Calculation of the Elementary Electric Charge from the Energy Quantum Model—H. Zuhrt. (*Arch. elekt. Ubertragung*, vol. 9, pp. 181–191; April, 1955.) By extending the theory developed previously (2252 of August and back references), a value of 5.17×10^{-10} esu is obtained for the elementary electric charge; this differs by 7.7 per cent from the established value for the electron, the difference being mostly due to the approximations used.

537.213:621.372:517.54 2902

Nets composed of Parts of Circles for the Approximate Solution of Field Problems—Tasny-Tschiassny. (See 3033.)

537.22 2903

Dielectric Layer with Spherical Cavity in Homogeneous Electrostatic Field—R. N. Kaufman. (*C. R. Acad. Sci., U.R.S.S.* vol. 101, pp. 633–636; April 1, 1955. In Russian.) The special case of a cavity with center equidistant from the two faces of the layer is considered mathematically; a method is indicated for solving the problem when the cavity is not centrally placed.

537.226 2904

Calculation of Internal Field in Relaxation Polarization in Polycrystalline Dipole-Type Dielectrics—G. I. Skanavi and A. N. Gubkin. (*Zh. eksp. teor. Fiz.*, vol. 28, pp. 85–95; January, 1955.)

537.311.62 2905

Skin Resistance of a Transmission-Line Conductor of Polygon Cross Section—H. A. Wheeler. (Proc. IRE vol. 43, pp. 805–808; July, 1955.) A theorem is presented according to which a conductor whose cross section is a polygon that can be circumscribed on a circle has the same skin resistance as a conductor of of the same material having the said circle as its cross section. See also 331 of 1943.

537.311.62 2906

Calculation of the A.C. Resistance of a Solid Conductor with Rectangular Cross-Section—L. Piglione. (*Electrotecnica*, vol. 41, pp. 221–224; April 25, 1954.) The Joule-effect losses are calculated, starting from Maxwell's equations and making assumptions corresponding to those for the case of a circular cross section. The results are compared with those obtained by investigating penetration depth.

537.5 2907

Statistical Description of Assemblies with Collective Interaction: Parts 1 and 2.—G. Ecker. (*Z. Phys.*, vol. 140, pp. 274–307; March 21, 1955.) A critical review of literature on the subject is presented. Two types of assemblies of electrons and ions are distinguished: (*a*) those with a finite number of discrete beams with definite velocity, and (*b*) those with thermally disordered motion with or without superimposed beams. Investigation of the first type of assembly leads to satisfactory results; the difficulties encountered in dealing with assemblies of the second type are due to neglecting the limitations of the models used. The model of the dispersed charge-carrier assembly presented by Twiss (1316 of 1953) is then considered and the concepts of collision and the collision zone are discussed.

537.52:537.226 2908

Phenomenological Theory of Townsend Breakdown in Dielectrics—P. L. Auer. (*Phys. Rev.*, vol. 98, pp. 320–327; April 15, 1955.)

537.52:538.56.029.6 2909

High-Frequency Gas Discharge Plasma in Hydrogen—D. J. Rose and S. C. Brown. (*Phys. Rev.*, vol. 98, pp. 310–316; April 15, 1955.) The microwave field strength required to maintain a hydrogen plasma in the steady state is calculated from theory based on a solution of the Boltzmann transport equation. The results are in satisfactory agreement with measurements made in a resonant cavity at different values of pressure and plasma concentration.

537.525 2910

Theory of High-Frequency Discharge in Gases at Low Pressures. Calculation of Electron Distribution Function—J. Salmon. (*J. Phys. Radium*, vol. 16, pp. 210–218; March, 1955.) The electron distribution is obtained by resolving Boltzmann's equation by a method of successive approximations, considering both elastic and inelastic collisions. The electron temperature corresponding to a Maxwellian velocity distribution is derived and the general form of the equation of evolution of electronic density is given.

537.525 2911

Role of Positive Ions in High-Voltage Breakdown in Vacuum—H. C. Bourne, Jr., R. W. Cloud, and J. G. Trump. (*Jour. Appl. Phys.*, vol. 26, pp. 596–599; May, 1955.)

537.525:621.396.822.029.62/.63 2912

Microwave and Metre-Wave Radiation from the Positive Column of a Gas Discharge—L. W. Davies and E. Cowcher. (*Aust. J. Phys.*, vol. 8, pp. 108–128; March, 1955.) Radiation intensity measurements were made at 200 mc and 3 kmc on a Ne discharge by inserting the positive column in a resonant cavity and comparing the cavity output with that of a known noise source. The rf power per unit bandwidth is expressed in terms of kT', where k is Boltzmann's constant and T' is the equivalent noise temperature and is comparable with the temperature of the electrons in the discharge. The departure of T' from the value corresponding to a Maxwell or Druyvesteyn electron-velocity distribution is investigated.

537.533 2913

Resonance-Type Secondary-Electron Multiplication—K. Krebs and H. Meerbach. (*Ann. Phys., Lpz.*, vol. 15, pp. 189–206; January, 15, 1955.) Electron multiplication by means of an hf field applied between a pair of parallel plates with secondary-electron emission rate greater than unity is considered theoretically and a relation is derived between the hf amplitude, the length of field lines and the phase at impact required for "avalanche" multiplication. Expressions are also obtained for the starting and cut-off voltages. Calculated results are in good agreement with experimental results. See also 2629 of 1954 (Hatch and Williams) and 790 of 1951 (Krebs).

537.533.8+535.215 2914

Delayed Electron Emission in Metals—K. Seeger. (*Z. Phys.*, vol. 141, pp. 221–236; April 21, 1955.) Continuation of earlier work (3266 of 1953). Results of experiments on W indicate that delayed-emission centers are imperfections in the lattice of the oxide surface film. These imperfections act as traps which can be emptied by heating to about 600 degrees C and destroyed by heating to 1,000 degrees C.

537.56 2915

Kinetic Theory of Weakly Ionized Homogeneous Plasmas: Part 2—M. Bayet, J. L. Delcroix and J. F. Denisse. (*J. Phys. Radium*, vol. 16, pp. 274–280; April, 1955.) The second-order approximation to the electron-velocity-distribution function, relating to the energy exchanges between an applied electric field and the plasma in a Lorentz-type gas, is developed. The resulting expression contains a divergent term corresponding to a nonstationary state in which the electron gas continually heats up. The quality factor, Q, of the plasma is calculated. The derivation of certain formulas used in part 1 (1624 of June) is given in an appendix.

537.56:538.56 2916

Longitudinal Plasma Oscillations: Part 1—A. A. Luchina. (*Zh. eksp. teor. Fiz.*, vol. 28, pp. 17–27; January, 1955.) A theoretical investigation is presented in which the effect of motion of ions is taken into consideration.

537.56:538.56 2917

Longitudinal Plasma Oscillations: Part 2—G. Ya. Myakishev and A. A. Luchina. (*Zh. eksp. teor. Fiz.*, vol. 28, pp. 28–37; January, 1955.) The equations derived in Part 1 (2916 above) are applied to the investigation of the dispersive properties of the plasma for the case of (*a*) hf oscillations, (*b*) lf oscillations, and (*c*) high electron-drift velocities. Results show that in the propagation of longitudinal waves in discharge tubes the motion of ions is frequently of importance. Formulas are derived for the dependence of the space periodicity and the damping coefficient on the discharge parameters.

537.568 2918

Recombination between Electrons and Positive Ions—M. Bayet and D. Quemada. (*J. Phys. Radium*, vol. 16, pp. 334–338; April, 1955.) A bibliography of 59 references is critically examined. Nearly always, recombination takes place by an interaction involving at least two atoms; direct recombination of an electron and a positive ion in a plasma, involving the radiation of excess energy, is relatively rare.

538.1:538.569.4.029.6 2919

Theory of Apparatus for Observation of Nuclear Magnetic Resonance—H. Pfeifer. (*Ann. Phys., Lpz.*, vol. 15, pp. 311–324; March 15, 1955.)

538.3 2920

A Postulational Approach to Electromagnetism—P. Moon and D. E. Spencer. (*Jour. Franklin Inst.*, vol. 259, pp. 293–305; April, 1955.)

538.561:537.1 2921

Interaction of Moving Charges with Wave Circuits—J. R. Pierce. (*Jour. Appl. Phys.*, vol. 26, pp. 627–638; May, 1955.) "When a charge moves along a nondispersive transmission line it induces forward and backward wave components in the line. For unaccelerated motion there is no radiation unless the charge moves with the speed of an unforced wave. For small accelerations, both radiation to the line and electromagnetic inertial effects caused by changes in the energy of the fields will be observed. The electromagnetic mass at velocities greater than the wave velocity is negative. Large accelerations can be handled by numerical computation. In the case of dispersive circuits, the charge radiates at frequencies for which the phase velocity of the circuit is equal to the velocity of the charge. This radiation is identified with Cherenkov radiation. Similar radiation takes place when a charge moves through a plasma."

538.561:537.122 2922

Čerenkov Radiation of Electrons moving parallel to a Dielectric Boundary—J. G. Linhart. (*Jour. Appl. Phys.*, vol. 26, pp. 527–533; May, 1955.) Analysis is based on an eigenfunction expansion of the em field. The process may be interpreted as an excitation of surface waves.

538.566+534.232 2923

Relation between the Intensity Distributions over Radiating Systems and their Directivity Characteristics—G. Eckart. (*Arch. elekt. Übertragung*, vol. 9, pp. 177–180; April, 1955.) Fourier-transform analysis is used to show that, contrary to Fischer's result (1221 of 1953), the directivity characteristic of a linear or plane radiator of finite dimensions is uniquely related to the amplitude distribution over the radiator. The theory is extended to the consideration of propagation media with local inhomogeneities acting as secondary radiators, and an investigation is made of the relation between distribution of inhomogeneities and the directivity characteristic of the scattered radiation.

538.566:535.31 2924

Study of the Electromagnetic Field in the Vicinity of a Reflecting Surface—M. Bouix. (*C. R. Acad. Sci., (Paris)*, vol. 240, pp. 1763–1765; May 2, 1955.) Analysis is given for the general case of a plane incident wave with elliptical polarization. If the reflecting surface is an infinite plane, the reflected wave is also plane; modifications of the reflected wave by other types of reflecting surface are mentioned.

538.566:537.311.31:539.23 2925

Simultaneous Partial Absorption, Reflection and Transmission of a Nonuniform Plane Wave by a Thin Metal Film—M. Gourceaux. (*C. R. Acad. Sci., (Paris)*, vol. 240, pp. 1871–1872; May 9, 1955.) The theory developed for uniform waves (1960 of July) is extended to nonuniform waves such as those propagated in waveguides. Appropriately modified expressions for the energy components are obtained by taking account of the guided-wave phase velocity. Conditions with a set of parallel films are discussed. A film of thickness such as to absorb 4/9 of the incident energy can be made totally absorbing by setting up standing waves at the back surface.

538.566:537.533 2926

The Interaction between an Obliquely Incident Plane Electromagnetic Wave and an Electron Beam: Part 1—H. Wilhelmsson. (*Chalmers tek. Högsk. Handl.*, No. 155, 31 pp., 1954. In English.) The investigation reported is relevant to the operation of mm-wave generators and to phenomena occurring in the solar corona. Analysis is presented for (*a*) magnetic field vector, and (*b*) electric field vector of the incident wave perpendicular to the electron beam; the general solution for an arbitrarily polarized wave is obtained as the sum of the two separate solutions. When the axial phase velocity of the wave is equal to the beam velocity, the beam behaves like a metal reflector. Coupling between different modes in the scattered wave and in the wave inside the beam is taken into account; this coupling vanishes if the wave is incident normally or if the beam is in vacuum. Resonance occurs at certain values of beam velocity.

538.566:621.372.8 2927

Direct Measurement of the Ellipticity of the R. F. Cotton Effect by the Quarter-Wave Method—R. Servant, P. Loudette and A. Charru. (*C. R. Acad. Sci., (Paris)*, vol. 240, pp. 1978–1980; May 16, 1955.) Measurements were made using a circular waveguide of diameter 7 cm with an antenna at one end connected to a 9-cm-λ klystron and a rotatable probe at the other end. Two copper pins of lengths 60 mm and 40 mm respectively are fixed 62 mm apart in an axial insulator rod making angles of 65 degrees and 35 degrees respectively with the direction of the electric field. The variation with wavelength of the plane of polarization and of the degree of extinction obtainable are shown graphically. It is shown that the wave is elliptically polarized by inserting a quarter-wave unit to produce a linear polarization.

538.569.4 2928

Electron Spin Resonance Absorption in Metals: Part 1—Experimental—G. Feher and A. F. Kip. (*Phys. Rev.*, vol. 98, pp. 337–348; April 15, 1955.) Measurements were made on Li, Na, K, Be, Mg, Al, Pd and W over the temperature range 4–296 degrees K, using a cavity-resonator technique at frequencies of 300 mc and 9 kmc. The dimensions of the specimens were in some cases large and in others small compared with skin depth. The results are compared with those predicted by Dyson's theory (2929 below).

538.569.4 2929

Electron Spin Resonance Absorption in Metals: Part 2—Theory of Electron Diffusion and the Skin Effect—F. J. Dyson. (*Phys. Rev.*, vol. 98, pp. 349–359; April 15, 1955.) Part 1: 2928 above.

538.569.4:535.33 2930

Inversion Spectrum of Ammonia—T. Nishikawa and K. Shimoda. (*Jour. Phys. Soc. (Japan)*, vol. 10, pp. 89–92; February, 1955.) As a result of an investigation over the frequency range 12–20 kmc, 29 lines have been found and 33 lines re-measured.

538.569.4:621.372.029.64 2931

Theory of Molecular [-beam] Oscillator and Molecular [-beam] Power Amlifier—N. G. Basov and A. M. Prokhorov. (*C. R. Acad. Sci. U.R.S.S.*, vol. 101, pp. 47–49; March 1, 1955. In Russian.) Theory is given of a device similar to that described by Gordon et al. (100 of January). The condition for self-excitation is stated and expressions are given for the frequency, amplitude and maximum power output of the oscillators and for the power-amplification factor and the condition for linear amplification of the amplifier.

539.181.08:537.311.33 2932

A Conductivity-Type Molecular-Beam Detector—G. Fricke and H. Friedburg. (*Z. Phys.*, vol. 141, pp. 171–174; April 21, 1955.) An iodine molecular beam can be detected by observing the change in conductivity due to introduction of impurities in a Cu_2O-film detector. The detection threshold of this device, which is briefly described, is about 5×10^9 molecules/cm^2.

GEOPHYSICAL AND EXTRATERRESTRIAL PHENOMENA

523.16 2933

Observations of a Variable Radio Source associated with the Planet Jupiter—B. F. Burke and K. L. Franklin. (*Jour. geophys. Res.*, vol. 60, pp. 213–217; June, 1955.) A variable source of radiation on 22.2 mc was observed on 9 records out of a possible 31 obtained during the first quarter of 1955. The derived position of the source corresponds to that of the planet Jupiter.

523.16:523.72 2934

Monochromatic Character of Bursts of Solar R. F. Radiation—V. V. Vitkevich. (*C. R. Acad. Sci. U.R.S.S.*, vol. 101, pp. 229–231; March 11, 1955. In Russian.) Bursts of solar-radiation in the 200-mc region were recorded simultaneously by two receivers tuned to frequency bands about 4 mc apart. Analysis of the observations indicates that the average effective bandwidth of all bursts is about 6 mc and that of high-intensity bursts (i.e., with intensities more than 50 per cent above the average) is about 12.3 mc. A note on similar work was published by E. Blum (*Ann. Univ. Paris*, vol. 23, p. 136; 1953).

523.16:53.088.22:621.396.677.3 2935

Correcting for Gaussian Aerial Smoothing—Bracewell. (*See* 2843).

523.16:621.396.822:523.755 2936

Results of Observations of Scattering of R.F. Waves by Electron [-density] Inhomogeneities of the Solar Corona—V. V. Vitkevich. (*C. R. Acad. Sci. U.R.S.S.*, vol. 101, pp. 429–432; March 21, 1955. In Russian.) Results similar to those reported by Machin and Smith (98 of 1953) were obtained in observations of the occulations of NGC 1952 in June, 1952, 1953, and 1954. The observations were made at wavelengths between 3.5 and 6 m. In 1954, interferometer base-lengths of 700 and 500 m were used at 5.8 m λ, giving beam widths of 28.5′ and 40′ respectively. Rapid amplitude changes were noticed; those associated with changes within a few seconds are believed to be due to the relativistic motion of electron inhomogeneities, those of the order of a few minutes to corpuscular streams.

523.2:538.3 2937

Of an Interplanetary Magnetic Field—A. Beiser. (*Jour. geophys. Res.*, vol. 60, pp. 155–159; June, 1955.) Arguments are presented for the existence of an interplanetary magnetic field of intensity not exceeding 5×10^{-8} G. Such a field would explain the observed cut-off in the primary cosmic-ray momentum spectrum and time delays in solar-terrestrial phenomena.

523.5:621.396.96 2938

Radio-Echo Observations of Meteors in the Southern Hemisphere—A. A. Weiss. (*Aust. J. Phys.*, vol. 8, pp. 148–166; March, 1955.) Results are presented of observations at Adelaide using apparatus similar to that described by Aspinall et al. (3003 of 1951), operating on a frequency of 67 mc, and by Robertson et al. (1424 of 1954), operating at 26.8 mc, for measurements of shower radiants and upper-atmosphere winds respectively.

523.72:621.396.822.029.6 2939

Solar R.F. Radiation at 10 cm Wavelength—B. Vauquois. (*C.R. Acad. Sci., Paris*, vol. 240, pp. 1862–1864; May 9, 1955.) The total emission at 10.7 cm λ depends on both total area and position of sunspots. The variation with distance of the sunspots from the center of the disk is expressed by a "darkening" factor whose value has been determined (*a*) directly, by observing the passage of groups of spots, and (*b*) by assigning trial values and comparing the resulting value of total emission with observations. Results by the two methods are in agreement. Consideration of absorption variations to be expected in consequence of variations of sunspot position indicates that the darkening must be partly due to the change of geometric form of the emitting areas.

523.746 2940

The Sunspot Cycle, 649 B.C. to A.D. 2000—D. J. Schove. (*Jour. geophys. Res.*, vol. 60, pp. 127–146; June, 1955.) Analysis of available records indicates that the mean period of the fundamental sunspot cycle is 11.1 years, the length of the cycle varying in the opposite sense to auroral activity; there is also a long-term cycle with a period of 77½–78 years.

523.75:550.385 2941

Solar Prominences and Geomagnetic Disturbance—W. O. Roberts and D. E. Trotter. (*Jour. Atmos. Terr. Phys.*, vol. 6, pp. 282–283; May, 1955.) An attempt, by statistical analysis of solar data, to identify the solar *M* regions with the large prominences observed at intermediate and high solar latitudes, gave negative results.

523.78 2942

Observations of the Infrared Radiation during the Solar Eclipse of 30th June 1954 in Tashkent—I. N. Yaroslavtsev. (*Bull. Acad. Sci. U.R.S.S., sér. géophys.*, pp. 185–186; March/April, 1955. In Russian.) Results presented graphically show the changes during the eclipse of the fraction of the total incident flux contained in the infrared band (curve 3).

550.385 2943

Time Relationship of Small Magnetic Disturbances in Arctic and Antarctic—S. J. Ahmed and W. E. Scott. (*Jour. geophys. Res.*, vol. 60, pp. 147–154; June, 1955.)

550.385:523.7:523.2:538.3 2944

Solar-Terrestrial Time Delays—A. Beiser (*Jour. geophys. Res.*, vol. 60, pp. 161–164; June, 1955.) The observed delay of about 24 hours between the meridian passage of a sunspot or flare and the onset of an associated magnetic storm or aurora is shown to originate in the deflection of the ion streams involved by either a solar magnetic dipole of moment $\not> 10^{29}$ G. cm^3, or an interplanetary magnetic field of intensity $\not> 4\times10^{-8}$ G, or a combination of the two. See also 2937 above.

551.510.4/.5 2945

Seasonal Variations of the Intensity of Bands due to OH and O_2 Molecules in the Atmosphere in the Luminescence of the Night Sky—P. Berthier. (*C.R. Acad. Sci., Paris*, vol. 240, pp. 1796–1798; May 2, 1955.)

551.510.4/.5 2946

Post-Twilight and Nocturnal Variations of Intensity of OH and O_2 Bands in the Near Infrared—P. Berthier. (*C.R. Acad. Sci., Paris*, vol. 240, pp. 1919–1921; May 9, 1955.)

551.510.535 2947

First Investigation of Ambient Positive-Ion Composition to 219 km by Rocket-Borne Spectrometer—C. Y. Johnson and E. B. Meadows. (*Jour. geophys. Res.*, vol. 60, pp. 193–203; June, 1955.) Measurements were made in the range 8–49 atomic mass units (amu). The most prominent ion peaks found at altitudes between 93 and 124 km on the ascent were at 16, 26, 30 and 32 amu. From 124 to 219 km ions of 16 and 32 amu persisted.

551.510.535 2948

On the Analysis of Experimental Recombinance Data using a Nonuniform Recombinance Model proposed by Chapman—Chong Chol Kim and C. Dickerman. (*Jour. geophys. Res.*, vol. 60, pp. 229–230; June, 1955.) Experimental values given by Mitra and Jones (114 of January) have been used to check the validity of Chapman's formula (708 of March) for height variation of recombinance, $\alpha=\alpha_0(1+e^{-cz})$. The best fit is obtained for $c=1.2$, with the recombinance datum level at 98 km. The relation between log $[n_{em}(\chi)/n_{em}(0)]$ and log cos χ, where $n_{em}(\chi)$ is the maximum density of electrons for solar zenith angle χ, is approximately linear over most of the range of χ, for $c=1$. Corrections to Chapman's paper are notified.

551.510.535:523.746.5:621.396.11 2949

The Influence of the Sunspot Cycle on the (M 3000) F_2 Transmission Factor—E. Theissen (*Jour. Atmos. Terr. Phys.*, vol. 6, pp. 243–249; May, 1955. In French.) An analysis of results obtained over a period of eight years by a number of stations north and south of the equator shows that the influence of the sunspot cycle on the height of the F_2 layer exhibits a seasonal and a diurnal variation, with a maximum effect in the afternoon. Noon and midnight values of the (M 3000) F_2 factor cannot be taken as representative of day and night.

551.510.535:523.78:621.396.81 2950

A Note on Radio Field Strength Observations made at Ahmedabad during the Total Solar Eclipse on 30 June 1954—Rastogi and Sheriff. (See 3077.)

551.510.535:621.3.087.4 2951

Instrumentation for the Continuous Measurement of Certain Ionospheric Echo Characteristics—R. W. Parkinson. (*Rev. Sci. Instrum.*, vol. 26, pp. 319–323; April, 1955.) Details are given of the receiving system associated with the equipment described by Jones (3599 of 1953). A crossed-loop antenna picks up both the direct and the reflected waves from the transmitter, about 5 km away. The elliptically polarized echo is resolved into components which are appropriately combined and displayed in succession on a cro. Examples are shown of continuous photographic records obtained. The resolution of split echoes is facilitated by suitably varying the cro beam intensity.

551.510.535:621.3.087.4 2952

A Panoramic Ionospheric Recorder for the Study of Travelling Disturbances in the Ionosphere—L. H. Heisler. (*Aust. J. appl., Sci.*, vol. 6, pp. 1–6; March, 1955.) A description is given of a recorder covering the frequency range 1–15 mc in 7½ or 15 seconds. This is achieved by heterodyning an oscillator which is continuously variable from 31 to 46 mc with a pulsed 30-mc oscillator and amplifying the resultant pulsed signal to provide the transmitter output. The same variable oscillator is used in the superheterodyne receiver. A block diagram of the recorder is given and typical *h′f* records are shown. Both single records on 16-mm film and continuous records on 35-mm film moving at 3/8 or 3/16 inch/min can be made, using cr tubes with long- and short-persistence screens respectively.

551.510.535:621.3.087.4 2953

Modern Ionosphere Sounding Equipment of the Netherlands PTT: Part 2—P. L. M. van Berkel. (*Tijdschr. ned. Radiogenoot.*, vol. 19, pp. 305–323; November, 1954. In English.) High-power slowsweep equipment is described. The tuning mechanism comprises a set of simultaneously and continuously variable coils and capacitors, covering the range 1.3–16 mc in one band. Sweep time is 100 s. Pulse output power is about 10 kw; pulse repetition frequency is usually 50 c/s. A special camera with continuous film transport is used. See also 2989 of 1953.

551.510.535:621.396.11.029.55/.62 2954

A Note on Factors affecting the Interpretation of Observations of Transient Echoes from the Ionosphere—Shain and Kerr. (*See* 3075.)

551.510.535:621.396.812.3:519.24 2955

Notes on Correlation Methods for Evaluating Ionospheric Winds from Radio Fading Records—D. G. Yerg. (*Jour. geophys. Res.*, vol. 60, pp. 173–185; June, 1955.) A method requiring only six values of the correlation coefficient, obtained from fading records at three receiver stations, is developed. The theory is extended to include elliptical constant-correlation contours in the horizontal plane. Data obtained during February, 1954 indicate that the correlation ellipse shows a preferred orientation and that fading associated with random changes in the ionosphere is as important as that associated with drift.

551.594.221 2956

Results of Lightning Measurements during the Years 1947–1954 on Monte San Salvatore—K. Berger. (*Bull. schweiz. elektrotech. Ver.*, vol. 46, pp. 405–424; April 30, 1955.) Electrical, magnetic and optical measurements made with the equipment described previously (2618 of September) are reported and discussed.

551.594.223 2957

Nature of Ball Lightning—P. L. Kapitsa.

(*C.R. Acad. Sci. U.R.S.S.*, vol. 101, pp. 245–248; March 11, 1955. In Russian.) Energy considerations indicate that ball lightning can be sustained neither by a chemical process nor by a nuclear process. It is suggested that the luminous ball could be produced in a weakly ionized gas by a resonance process, the energy required to increase the ionization and then to maintain it inside a sphere of diameter d being supplied by rf waves with $\lambda = 3.65\, d$. The center of the sphere would coincide with a maximum of the wave interference field. The rf waves could be due to an oscillatory process in the ionized atmosphere excited by a lightning discharge. The proposed mechanism also explains bead lightning, the absence of influence of wind on the position of the luminous ball, and the waveguide effect of chimneys. Explosive and quiet types of decay are associated respectively with rapid and slow changes in the rf field strength at the end of the phenomenon. Observations in the decimeter-λ region ($d \approx 10$ to 20 cm) during thunderstorms and experiments on the artificial production of ball lightning are suggested.

551.594.5:621.396.11.029.62 2958

Radio Observations of the Aurora—N. C. Gerson. (*Jour. Atmos. Terr. Phys.*, vol. 6, pp. 263–267; May, 1955.) Observations during the period 1949–1951 by means of transmissions over North America mainly at 50 mc indicate that the ionization aurora occurs with greatest frequency near the equinoxes, as does the visual aurora.

LOCATION AND AIDS TO NAVIGATION

621.396.933 2959

The Accuracy of the V.H.F. Omnirange System of Aircraft Navigation: a Statistical Study—W. G. Anderson. (*Trans. IRE*, vol. ANE-2, pp. 25–37; March, 1955.)

621.396.96+621 396.933 2960

New Navigational Aids—(*Wireless World*, vol. 61, pp. 375–377; August, 1955.) Radio and radar equipment at the 1955 Paris air show included apparatus for remote presentation of radar signals by television, incorporating a signal-storage cr tube at the radar site; a device for reducing cloud clutter in airborne collision-warning radar; and a blind-landing system operating on a single frequency.

621.396.96 2961

Some C.F.T.H. Radar Equipment for the 10-cm Band—P. Bouvier. (*Rev. tech. Comp. franç., Thomson-Houston*, No. 19, pp. 11–25; April, 1955.)

621.396.96 2962

Effect of Internal Fluctuations and Scanning on Clutter Attenuation in M.T.I. [moving-target-indication] Radar—R. S. Grisetti, M. M. Santa, and G. M. Kirkpatrick. (*Trans. IRE*, vol. ANE-2, pp. 37–41; March, 1955.) Charts are presented showing (*a*) the effect of fluctuations of the scatterers and (*b*) the improvement obtainable by scanning and by using antennas with specially shaped radiation patterns.

621.396.96 2963

Cumulative Probability of Radar Detection—T. J. Rooney, L. S. Rider, and B. H. Rudwick. (*Tele-Tech*, vol. 14, Section 1, pp. 70–72, 184; April, 1955.) The probability of detecting a target on two successive scans before it reaches a given range is a function of the number of times it has been scanned and of the probabilities that it is seen on each of these scans. Tables and curves are given for evaluating this function and for determining the optimum scan rate for given target velocities.

621.396.96:519.2 2964

Signal-to-Noise Improvement and the Statistics of Track Populations—N. Wax. (*Jour. Appl. Phys.*, vol. 26, pp. 586–595; May, 1955.) Tracking processes such as those involved in radar tracking and in scanning nuclear emulsions are studied. The equilibrium track population, the age distribution of the population at equilibrium, and a signal-to-noise improvement factor are obtained for each of the models considered. The equilibrium population can be kept to reasonably small values and the signal-to-noise ratio improved if effective methods are used to eliminate deteriorating tracks.

621.396.96:621.396.6 2965

Microwave Circuits for Radar Transmitter-Receivers—L. Milosevic. (*Rev. tech. Comp. franç. Thomson-Houston*, No. 19, pp. 27–57; April, 1955. A detailed and fully illustrated account of equipment of the type installed at the Orly airport in 1953.

621.396.963.3 2966

A Note on Trace-to-Trace Correlation in Visual Displays: Elementary Pattern Recognition—P. McGregor. (*Jour. Brit. IRE*, vol. 15, pp. 329–331; June, 1955.) Subjective tests made with chemical-recorder and cr-tube intensity-modulated displays show that over a range of input signal-noise ratio from -10 to 0 db, correlation of successive traces offers an improvement of detectability with increasing number of scans better than that theoretically obtained by "integration."

MATERIALS AND SUBSIDIARY TECHNIQUES

531.788:621.316.86:537.312.6 2967

Use of Thermistors as Vacuum Gauges—Y. Lortie. (*J. Phys. Radium*, vol. 16, pp. 317–320; April, 1955.) The conditions necessary to secure maximum reliability and sensitivity over a given pressure range are discussed, with special reference to the range $1-10^{-3}$ mm Hg.

535.215+537.533.8 2968

Effect of Electron Bombardment on Secondary and Photo-electron Emission of Cesium-Antimonide—K. Miyake. (*Jour. Phys. Soc. Japan*, vol. 10, pp. 164–165; February 1955.) Fatigue effects and modifications of the spectral photoelectric response are shown graphically.

535.215:537.311.33 2969

Temperature Dependence of the Width of the Band Gap in Several Photoconductors—R. H. Bube. (*Phys. Rev.*, vol. 98, pp. 431–433; April 15, 1955.) The temperature variation of the energy gap in CdS, CdSe, CdTe and ZnSe is determined from measurement of the photosensitivity/wavelength characteristic at various temperatures between 90 degrees and 400 degrees K. The observations for CdS and CdSe suggest the existence of double conduction or valence bands.

535.215:546.32 2970

Experimental Contribution to the Theory of the External Photoelectric Effect in Compact Alkali Metals—R. Suhrmann. (*Z. Naturf.*, vol. 9a, pp. 968–973; November, 1954.) The form of the observed spectral sensitivity curve for very pure K surfaces is discussed. A maximum is exhibited at 400 mμ; this is attributed to the variation with wavelength of the absorption coefficient and to the small depth from which the photoelectrons are emitted.

535.215:546.47–31 2971

Influence of Oxygen, Water Vapour and Organic Compounds on Photoelectric Processes in Zinc Oxide—E. K. Putseiko and A. N. Terenin. (*C. R. Acad. Sci. U.R.S.S.*, vol. 101 pp. 645–648; April 1, 1955.) In Russian.) Results of measurements of the change of photo-emf with short-period and with continuous illumination are presented graphically and are discussed. No effect was observed as being due to the different methods used in preparing the ZnO specimens.

535.215:546.482.21 2972

Intermittent-Illumination Measurements on Photoconducting CdS—E. A. Niekisch. (*Ann. Phys., Lpz.*, vol. 15, pp. 279–301; March 15, 1955.) The method discussed was described previously by Fassbender and Lehman (*ibid.*, vol. 6, p. 215; 1949), and makes use of the possibility of varying the electron concentration of photoconductors independently of the mobility. The value found for the mobility by this method is not the "micromobility," but a quantity dependent on the trap distribution; if the micromobility is known, the trap distribution can hence be determined. Measurements are reported of the variation of the dc and ac components with temperature and with the intensity of the intermittent illumination. Interpretation of the results does not require the assumption of a marked temperature dependence of the recombination coefficient.

535.215:546.482.21:621.396.822 2973

Measurement of Shot Noise in CdS Crystals—C. I. Shulman. (*Phys. Rev.*, vol. 98, pp. 384–386; April 15, 1955.) "The noise power spectrum associated with photoconduction current in CdS crystals with indium electrodes is found to flatten off at low frequencies at a value that corresponds closely to the noise inherent in the photon absorption process itself plus that associated with the random nature of the carrier recombination process. It is found that the noise power is not a unique function of the photoconduction current, but varies as the square of the applied voltage, and linearly with light intensity, as suggested by a simple model not unlike that of the photomultiplier."

535.37 2974

Paramagnetic Resonance Spectrum of Some Doubly Activated Phosphors—W. Low. (*Phys. Rev.*, vol. 98, pp. 426–431; April 15, 1955.) Investigations of SrS phosphors with various rare-earth activators are reported.

535.37 2975

Thermoluminescence of Alkali Halide Phosphors—H. N. Bose. (*Proc. Phys. Soc.*, vol. 68, pp. 249–252; April 1, 1955.)

535.37 2976

Determination of the Depths of Electron Traps by Thermoluminescence—G. Curie and D. Curie. (*Jour. Phys. Radium*, vol. 16, pp. 199–205; March, 1955.)

535.37 2977

ZnS (Ag) Phosphor Mixtures for Neutron Scintillation Counting—P. G. Koontz, G. R. Keepin and J. E. Ashley. (*Rev. sci. Instrum.*, vol. 26, pp. 352–356; April, 1955.)

535.37:532.11 2978

Some Investigations on the Effects of Pressure of the Luminescence of Solids—(*Bull. Res. Counc. Israel*, vol. 4, pp. 219–224; December, 1954.)

Part 1 (pp. 219–221).—E. A. Braun.
Part 2 (pp. 222–224).—E. A. Braun and A. Barouch.

535.37:537.311.33 2979

Decay of Phosphorescence with Activators and Traps arising from the same Impurity in Different Valency States—K. Lehovec. (*J. opt. Soc. Amer.*, vol. 45, pp. 219–222; March, 1955.)

535.376 2980

Radiation-Controlled Electroluminescence and Light Amplification in Phosphor Films—D. A. Cusano. (*Phys. Rev.*, vol. 98, pp. 546–547; April 15, 1955.) Preliminary report of effects observed when a voltage is applied to a nongranular layer of ZnS:Mn,Cl phosphor excited by ultraviolet or X rays.

535.376 2981

Theoretical Basis for Light-Amplifying Phosphors—F. E. Williams. (*Phys. Rev.*, vol. 98, pp. 547–548; April 15, 1955.) Brief discussion of electroluminescence indicating mechanisms which may be responsible for producing light amplification.

535.376:546.472.21 2982

Decay of Luminescence of Silver-Activated Zinc Sulphide Phosphors following Excitation by Single α Particles and Electrons—D. Smidt. (*Ann. Phys., Lpz.*, vol. 15, pp. 325–336; March 15, 1955.) Measurements on phosphors in powder and in single-crystal form are reported. The decay curve is hyperbolic, as for excitation by light. An empirical formula is derived relating activator concentration and decay time constant. The diffusion of holes and conduction electrons is discussed.

537.226/.227 2983

Dielectric Properties of Lead-Strontium Titanate—S. Nomura and S. Sawada. (*J. phys. Soc. Japan*, vol. 10, pp. 108–111; February, 1955.) Experiments are reported indicating that lead-strontium titanate is ferroelectric. The Curie temperature decreases linearly with increase of the Sr^{2+} content; no other transition point was observed.

537.226/.227 2984

Dielectric Properties of Titanates containing Sn^{4+} Ions: Part 1—S. Nomura. (*J. phys. Soc. Japan*, vol. 10, pp. 112–119; February, 1955.) Dielectric and thermal properties and lattice constants of the solid solutions of $Pb(TiSn)O_3$ and $Ba(TiSn)O_3$ were investigated, for the purpose of making clear the role of the Y ion in compounds of the perovskite type, XYO_3. The variations with composition of the Curie point are reported. An anomalous hysteresis phenomenon observed in Pb(25 per cent Ti-75 per cent Sn)O_3 suggests that the Ti^{4+} and Sn^{4+} ions respond differently to the external field in the ferroelectric state.

537.226/.227:546.431.824–31 2985

Phase Equilibria in the System BaO-TiO_2—D. E. Rase and R. Roy. (*J. Amer. ceram. Soc.*, vol. 38, pp. 102–113; March, 1955.) Extensive investigations using quenching, strip-furnace and thermal techniques indicate the existence of five intermediate compounds in the system BaO—TiO_2; these are the orthotitanate Ba_2TiO_4, the metatitanate $BaTiO_3$, the dititanate $BaTi_2O_5$, the trititanate $BaTi_3O_7$ and the tetratitanate $BaTi_4O_9$. Properties of these compounds are tabulated. Application of the results to the manufacture of titanate bodies and to the growth of single crystals of $BaTiO_3$ is discussed.

537.226.2 2986

Dielectric Anomaly of Ammonium Sulfate at its Transition Temperature—K. Kamiyoshi and T. Miyamoto. (*Sci. Rep. Res. Inst. Tohoku Univ.*, Ser. A, vol. 7, pp. 91–98; February, 1955.) An anomalous variation of the dielectric constant accompanied by a phase transition in a single crystal of ammonium sulphate was observed at af and rf. A sharp peak appeared in the *a*-axial direction and kinks appeared in *b*- and *c*-axial directions; the transition temperature was -36 degrees C on cooling and -29 degrees C on heating. The dielectric constants at room temperature were 8.0, 7.45 and 6.7 along *a*-, *b*- and *c*-axial directions, respectively. They are independent of frequency between 10 and 10^5 kc. The transition temperature of a pressed polycrystalline powder specimen was about -53 degrees C

537.227 2987

New Class of Ferroelectrics—A. N. Holden, B. T. Matthias, W. J. Merz, and J. P. Remeika. (*Phys. Rev.*, vol. 98, p. 546; April 15, 1955.) Guanidine aluminium sulphate hexahydrate $(CN_3H_6)Al(SO_4)_2 . 6H_2O$ has been observed to be ferroelectric at temperatures from about 200 degrees C downwards.

537.227./228:537.311.33 2988

Space-Charge Layer near the Surface of a Ferro-electric—W. Känzig. (*Phys. Ref.*, vol. 98, pp. 549–550; April 15, 1955.) Theoretical considerations indicate that space-charge layers and associated strong electric fields near the surface of highly polarizable semiconductors could produce observable piezoelectric or electrostrictive strain. Experimental evidence for the existence of such layers in $BaTiO_3$ is mentioned.

537.227:546.321.85–841 2989

Spontaneous Polarisation of KH_2PO_4 and KD_2PO_4 Crystals versus Temperature—J. Pirenne. (*Physica*, vol. 21, pp. 219–222; March, 1955.)

537.227:546.431.824–31 2990

Etch Patterns and Ferroelectric Domains in $BaTiO_3$ Single Crystals—J. A. Hooton and W. J. Merz. (*Phys. Rev.*, vol. 98, pp. 409–413; April 15, 1955.) Technique for investigating ferroelectric domains in $BaTiO_3$ is based on the observed fact that the positive end of the electric dipole in the material etches much faster than the negative end.

537.228.1 2991

Piezoelectricity of Wood—E. Fukada. (*J. Phys. Soc. Japan*, vol. 10, pp. 149–154; February, 1955.) The direct and converse piezoelectric effects were studied in maple, spruce and ash. The magnitude of the piezoelectric constants $d_{14}(=-d_{25})$ is of the order of 10^{-9} esu. The apparent piezoelectricity of wood may be explained by a particular arrangement of natural cellulose micelles. The experimental arrangement is described and results are presented in tabular and graphical form.

537.311.31+537.533 2992

Dependence of Electrical Conductivity and Electron Emission on Power Consumption of Metal during Heating by [pulsed] High-Density Current—L. N. Borodovskaya and S. V. Lebedev. (*Zh. eksp. teor. Fiz.*, vol. 28, pp. 96–110; January, 1955.) In heating Ni wires by currents of densities $6\times10^4-5\times10^6$A/cm^2 effects similar to those observed in W [3528 and 3574 of 1954 (Lebedev and Khaikin)] were found. Discontinuities were found in the resistance/energy-supplied curve; their positions remained independent of variations of the current density in Ni, W, Au, and constantan wires. The emission from Ni at current densities of about 10^5A/cm^2 was 1.6×10^{-4}A/cm^2, about 50 times that at the melting point.

537.311.33 2993

Forbidden and Permitted Bands in Impure Semi-conductors and in Disordered Alloys—J. des Cloizeaux. (*J. Phys. Radium*, vol. 16, pp. 320–324; April, 1955.) The semiconductor or disordered alloy is represented by a unidimensional crystal made up of cells of two distinct types, distributed at random. In such a distribution domains of impurity of any concentration may occur, consequently the permitted energy bands are much wider than in ordered distributions. Calculations are made for the general case and for some particular distributions. In the general case permitted bands exist outside the limits of bands permitted in either of the separate constituents.

537.311.33 2994

Propagation and Plasma Oscillation in Semiconductors with Magnetic Fields—B. Lax and L. M. Roth. (*Phys. Rev.*, vol. 98, pp. 548–549; April 15, 1955.) Magneto-ionic theory is applied to study semiconductors whose energy surfaces in the Brillouin zone are ellipsoidal or warped spheres possessing cubic symmetry.

537.311.33:[546.28+546.289 2995

Cyclotron Resonance of Electrons and Holes in Silicon and Germanium Crystals—G. Dresselhaus, A. F. Kip, and C. Kittel. (*Phys. Rev.*, vol. 98, pp. 368–384; April 15, 1955.) Measurements are made at temperatures near 4 degrees K in order to obtain relaxation times long enough to permit observation of cyclotron resonance with X- or K- band equipment. An optical method is used to generate free carriers. Anisotropy effects are observed. In both Si and Ge the electron energy surfaces near the band edge are deduced to be prolate spheroids; formulas are also given for the hole energy surfaces.

537.311.33:546.28 2996

Optical Determination of Base Width in Grown *n-p-n* Silicon Crystals—A. Fowler and P. Levesque. (*Jour. Appl. Phys.*, vol. 26, pp. 641–642; May, 1955.) A development of the etching technique described by Billing and Dowd (3332 of 1953).

537.311.33:546.289 2997

Thermal Acceptors in Germanium—R. J. Hodgkinson. (*Phil. Mag.*, vol. 46, pp. 410–421; April, 1955.) Results reported earlier (*G.E.C.J.*, vol. 21, pp. 63–70; January, 1954) are examined on the assumption that the thermal acceptors are Cu atoms. A thermodynamic treatment of the solid solubility of Cu in Ge is given in terms of the Principle of Lowest Free Energy. An equation derived, relating the concentration of Cu on the liquidus and solidus to the temperature, is equivalent to one previously derived by Thurmond and Struthers (2420 of 1954) and is shown to be in good agreement with experimental results.

537.311.33:546.289 2998

Properties of Germanium Doped with Nickel—W. W. Tyler, R. Newman, and H. H. Woodbury. (*Phys. Rev.*, vol. 98, pp. 461–465; April 15, 1955.) "The temperature dependence of electrical resistivity in *p*- and *n*-type nickel-doped germanium crystals indicates that nickel introduces two acceptor levels in germanium at 0.22 ± 0.01 ev from the valence band and 0.30 ± 0.02 ev from the conduction band. Ionization energies deduced from infrared photoconductivity studies at 77 degrees K are in agreement with the values obtained from resistivity measurements. *N*-type samples show higher photosensitivity than *p*-type samples and demonstrate quenching effects. The distribution coefficient for nickel in germanium is about 2.3×10^{-6}."

537.311.33:546.289 2999

Measurement and Interpretation of Conductance of P-Type Inversion Layers on Germanium—G. A. deMars, H. Statz, and L. Davis, Jr. (*Phys. Rev.*, vol. 98, pp. 539–540; April 15, 1955.) Measurements similar to those made previously on *n*-type inversion layers [e.g. 166 of 1954 (Brown)] are reported and discussed.

537.311.33:546.289 3000

Structure of Surface States at the Germanium/Germanium-Oxide Interface—H. Statz, L. Davis, Jr., and G. A. deMars. (*Phys. Rev.*, vol. 98, pp. 540–542; April 15, 1955.) The surface states are discussed in relation to the observed variation of conductance on application of a switching voltage.

537.311.33:546.289 3001

Influence of Various Etchants on Germanium: Part 1—Chemical Action of some Agents on Ge—O. Rösner. (*Z. Metallkde*, vol. 46, pp. 225–229; March, 1955.) The action of some liquid and gaseous agents was investigated by microscope and by gravimetric methods. Ge is strongly attacked by water, especially on prolonged boiling. Oxidation occurs in air; the reaction $GeO_2+Ge=2GeO$ is observed at 900 degrees C. Carbonic acid attacks Ge at temperatures above 700 degrees C. The possibility of recovering Ge from various etching solutions is discussed and some numerical results are presented.

537.311.33:546.289 **3002**

Influence of Various Etchants on Germanium: Part 2—Physical Considerations—G. Zielasek. (*Z. Metallkde*, vol. 46, pp. 229–233; March, 1955.) Measurements of surface potential of etched polycrystalline specimens indicated sudden resistivity changes of some hundreds of ohm-centimeters at grain boundaries; both these and the ordinary resistivity distributions within single crystals are demonstrated by maps of the equipotential lines. Use of a template to simplify determinations of carrier lifetime is described. A mean value of about 4 μs was found for the hole lifetime in polycrystalline *n*-type material, and values up to 700 μs for single crystals.

537.311.33:546.289 **3003**

Mass-Spectrometer Investigations of Germanium—G. Köhl. (*Z. Naturf.*, vol. 9a, pp. 913–918; November, 1954.) A method is described capable of indicating the presence in Ge of elements with relative concentrations as low as 10^{-5} to 10^{-6}.

537.311.33:546.289:537.534.9 **3004**

Effects produced by the Ionic Bombardment of Germanium—W. D. Cussins. (*Proc. Phys. Soc.*, vol. 68, pp. 213–222; April 1, 1955.) Single-crystal and polycrystalline specimens were bombarded with positive ions of energy ranging from 5 to 90 kev; elements of atomic number ranging from 1 to 51 were used. The effect on rectification characteristics and thermoelectric properties was investigated; in all cases maximum effect was produced by bombardment equivalent to about 6 μC/cm^2. No effect was observed for ion energies less than about 20 kev. The results are consistent with the assumption that bombardment produces a *p*-type layer, whether the original specimen is *p*-type or *n*-type. Reference is made to a similar investigation on Si [see e.g. 1337 of 1952 (Ohl)].

537.311.33:546.289:538.63 **3005**

On the Hall Effect of *P*-type Germanium in the Near Intrinsic Range—Y. Kanai and K. Furusyō. (*J. phys. Soc. Japan*, vol. 10, pp. 165–166; February, 1955.) Experiments were made using high values of magnetic field H to facilitate examination of terms involving powers of H higher than the first. The variation of Hall constant with values of H up to 7 kg is shown graphically for various temperatures up to 85 degrees C. The variation is in the opposite sense to that calculated by Madelung (3579 of 1954).

537.311.33:546.48-31 **3006**

The Electrical Conductivity of Cadmium Oxide at Low Temperatures—J. A. Bastin and R. W. Wright. (*Proc. Phys. Soc.*, vol. 68, pp. 312–315; April 1, 1955.) Measurements of the conductivity of sintered CdO over the temperature range 1 degree–250 degrees K together with measurements reported by Wright (2200 of 1951) over the range 100 degrees–700 degrees K are compared with the theoretical expression for the conductivity of an ionic crystal derived by Howarth and Sondheimer (381 of 1954). The resistance at zero temperature is discussed in relation to impurity scattering and crystalline boundary resistances.

537.311.33:546.482.31 **3007**

Electrical Conductivity of Cadmium Selenide—K. Hauffe and H. G. Flint. (*Ann. Phys., Lpz.*, vol. 15, pp. 141–147; January, 1955.) The dependence of the conductivity χ on Cd- and Se-vapor partial pressures p_{Cd} and p_{Se} was investigated experimentally in the temperature range 300–500 degrees C. For $p_{\mathrm{Cd}} > 10^{-1}$ Torr, $\chi \propto p_{\mathrm{Cd}}^{1/4.5}$, below 10^{-1} Torr χ is practically independent of p_{Cd}. For $p_{\mathrm{Se}} > 10^{-2}$ Torr $\chi \propto p_{\mathrm{Se}}^{-1/2}$, below 10^{-2} Torr χ is independent of p_{Se}. Additions of $\mathrm{T1_2Se}$ up to 0.1 per cent mol reduce the conductivity. The results are discussed.

537.311.33:546.561-31 **3008**

Some Semiconductor Properties of Cu_2O—C. Fritzsche. (*Ann. Phys., Lpz.*, vol. 15, pp. 178–181; January. 15, 1955.) Experimental results indicate that the variation of conductivity of Cu_2O caused by heat treatment is more closely related to the CuO-Cu_2O equilibrium conditions than to the impurity concentration curves for Cu_2O. See also 2432 of 1954.

537.311.33:546.681.18 **3009**

Semiconductor Properties of Gallium Phosphide—O. G. Folberth and F. Oswald. (*Z. Naturf.*, vol. 9a, pp. 1050–1051; December, 1954.) Optical measurements indicate that the absorption edge lies in the visible region. The width of the energy gap is 2.4 ev at absolute zero and the variation with temperature is -5.5×10^{-4} ev/degrees K over the range 100 degrees–500 degrees K.

537.311.33:546.682.19 **3010**

Electrical Properties of InAs: Part 2—O. G. Folberth, O. Madelung, and H. Weiss. (*Z. Naturf.*, vol. 9a, pp. 954–958; November, 1954.) Continuation of work abstracted previously [3268 of 1954 (Folberth *et al.*)]. The width of the energy gap is 0.47 ± 0.02 ev at absolute zero, with a temperature variation of -4.5×10^{-4} ev/degrees K. The electron mobility passes through a maximum value of about 30,000 cm/s per v/cm at room temperature, the corresponding value for the holes being 200 cm/s per v/cm.

537.311.33:546.682.86 **3011**

Cyclotron and Spin Resonance in Indium Antimonide—G. Dresselhaus, A. F. Kip, C. Kittel, and G. Wagoner. (*Phys. Rev.*, vol. 98, pp. 556–557; April 15, 1955.) Observations at a frequency of 24 kmc are briefly reported.

537.311.33:546.811-17:538.22 **3012**

Magnetic Properties of the Exciton—A. G. Samoilovich and M. V. Kononova. (*C.R. Acad. Sci. U.R.S.S.*, vol. 101, pp. 55–57; March 1, 1955. In Russian.) A brief theoretical note with particular reference to the magnetic properties of semiconductors. A numerical check of the formula for magnetic susceptibility for the case of grey tin shows fair agreement with experimental results reported by Busch and Mooser (1476 of 1954) over a large temperature range.

537.311.33:62.314.63 **3013**

The Effect of Discontinuous Space Charge on Rectifier Characteristics—G. G. Wiles. (*Phil. Mag.*, vol. 46, pp. 363–375; April, 1955.) An expression is derived for the local current density in the blocking direction near an impurity center situated in the semi-conductor at an optimum distance from the metal. The effects of these local currents on the average current through the interface is evaluated for the case of a uniform distribution of impurity centers. For semi-conductors with a dielectric constant of 10 a continuous distribution of space charge can be assumed for impurity-center concentrations up to 10^{16}/cm^3, but the error becomes appreciable at 10^{18}/cm^3. The case of a random distribution is treated by a more approximate method; the results are similar to those for a uniform distribution.

537.32 **3014**

On the Thermoelectric Power of Metals—D. ter. Haar and A. Neaves. (*Proc. roy. Soc. A*, vol. 228, pp. 568–574; March 22, 1955.) A theoretical paper based on a method employed by Makinson (2343 of 1940). An expression is derived for the contribution of the lattice current to the thermoelectric power of metals at temperatures where electron-phonon scattering predominates. In this range the thermoelectric effect will be of opposite sign to that which follows from simple electron theory of metals. The effect discussed cannot explain the known behavior of alkali metals completely.

538.22 **3015**

Magnetic Anisotropy and Van Vleck's Relation for Antiferromagnetics—K. F. Niessen. (*Philips Res. Rep.*, vol. 10, pp. 131–140; April, 1955.) Account is taken of the two kinds of magnetic spin in deriving formulas for the influence of magnetic anisotropy on the susceptibility of antiferromagnetics and for the relation between the powder susceptibilities at 0 degrees K and at the Curie temperature.

538.22:548.0 **3016**

Theory of Ionic Ordering, Crystal Distortion, and Magnetic Exchange Due to Covalent Forces in Spinels—J. B. Goodenough and A. L. Loeb. (*Phys. Rev.*, vol. 98, pp. 391–408; April 15, 1955.) "A new magnetic exchange mechanism, "semicovalent exchange," which is consistent with the covalent model, is used to explain the magnetic properties of spinels."

538.221 **3017**

The ΔE-Effect and Young's Modulus in Nickel-Cobalt Alloys—M. Yamamoto and S. Taniguchi. (*Sci. Rep. Res. Inst. Tohoku Univ.*, Ser. A, vol. 7, pp. 35–49; February, 1955.) Measurements are reported covering the whole range of composition of Ni-Co alloys; a magnetostrictive-vibration method was used. See also 1077 of April (Yamamoto).

538.221 **3018**

The Absence of Block Walls in Certain Ferromagnetic Materials—P. M. Prache. (*Câbles & Transm.*, vol. 9, pp. 172–173; April, 1955.) Arising out of the work of Néel (3151 of 1947) it is shown that Block walls cannot exist in polycrystalline specimens of ferromagnetic materials when the crystal diameter is less than a critical value. For ordinary soft iron this value is about 20 μ.

538.221 **3019**

Causes of Permeability Variations of Iron-Silicon Single Crystals on cooling in a Magnetic Field—H. Fahlenbrach. (*Naturwiss.*, vol. 42, pp. 174–175; April, 1955.) The effect on a 35 per cent Si-Fe alloy of cooling in a magnetic field was investigated by observation of domain structure and by measurement of initial magnetization curves, using corner-shaped specimens and a circular magnetic field. Different results are obtained depending on the orientation of the specimen relative to the field. A detailed report is to appear in Technische Mitteilungen Krupp.

538.221 **3020**

Characteristic Bitter Patterns on Internally Strained Silicon-Iron Crystals—W. Stephan. (*Ann. Phys., Lpz.*, vol. 15, pp. 337–344; March 15, 1955.)

538.221:538.569.4 **3021**

Interaction between Spin Waves and Conduction Electrons in Ferromagnetic Metals—E. Abrahams. (*Phys. Rev.*, vol. 98, pp. 387–390; April 15, 1955.) Calculations of relaxation time indicate that the effect due to interaction between ferromagnetic spins and conduction-electron currents is much more important than that due to interaction between ferromagnetic spins and conduction-electron spins.

538.221:538.569.4 **3022**

Ferromagnetic Resonance Absorption in $BaFe_{12}O_{19}$, a Highly Anisotropic Crystal—J. Smit and H. G. Beljers. (*Philips Res. Rep* vol. 10, pp. 113–130; April, 1955.) Measurements at 24 kmc show that resonance conditions are strongly influenced by the anisotropy of the hexagonal crystal and also with nonsaturating fields, by the domain structure. Absorption peaks predicted by theory were observed. Values are found for the anisotropy field and for the gyroscopic splitting factor, *g*, this latter showing the spin-only value. The anisotropy is probably caused by dipole-dipole interaction.

538.221:538.639:546.3-1-72-74-73 3023

Goldhammer Effect in Alloys of the Ternary System Iron-Nickel-Cobalt—N. V. Grum-Grzhimailo. (*Bull. Acad. Sci. U.R.S.S., tech. Sci.*, pp. 137–139; December, 1954. In Russian.) Results are tabulated and presented graphically of an investigation of the dependence of the relative change of resistance under the influence of a longitudinal magnetic field (Goldhammer effect) on the composition of the alloy. A characteristic of the diagram is the discontinuity near the composition $FeNi_3CoNi$. No special effect is exhibited at phase boundaries.

538.221:621.318.134 3024

Magnetic Rotation Phenomena in a Polycrystalline Ferrite: Part 2—D. Park. (*Phys. Rev.*, vol. 98, pp. 438–441; April 15, 1955.) Calculations made previously (2036 of July) are extended to the determination of the complete permeability tensor for a sample with a net uniform magnetization.

538.221:621.318.134 3025

Direct Observation of Domain Rotation in Ferrites—F. Brown and C. L. Gravel. (*Phys. Rev.*, vol. 98, pp. 442–448; April 15, 1955.) An experimental investigation was made using a Ni-ferrite sphere of diameter 5 mm with mutually perpendicular primary and secondary loops surrounding it. The system was adjusted for minimum rf signal with the sphere demagnetized; application of a magnetic field as low as 5 oersted perpendicular to both loops produced a measurable induction signal attributable to domain rotation as distinct from domain-wall motion. Measurements were made over the frequency range 20–800 mc. Dispersion effects are discussed.

539.23 3026

Optical Constants of Thin-Film Materials—G. D. Scott. (*J. opt. Soc. Amer.*, vol. 45, pp. 176–179; March, 1955.) A short survey covering both metal and dielectric films.

546.719 3027

Rhenium Metal—C. T. Sims. (*Mater. & Meth.*, vol. 41, pp. 109–111; March, 1955.) The physical and mechanical properties of Re are briefly discussed and compared with those of W and Mo. Possible applications include tube heater filaments and electrical contacts. The metal is more resistant than W to water vapor.

549.514.51 3028

Variation of the Elastic Constants of Quartz with Pressure up to 1000 Atm—C. Susse. (*J. Phys. Radium*, vol. 16, pp. 348–349; April, 1955.) Resonance-frequency/pressure characteristics of quartz crystals cut at various angles provide an indication of the variation of the elastic constants with pressure. See also 432 of 1953 (Pérez and Johannin).

621.315.613.1 3029

Conductivity induced in Mica by X-Rays—J. F. Fowler and F. T. Farmer. (*Nature, London*, vol. 175, p. 648; April 9, 1955.) Results of experiments indicate that the conductivity induced in mica by X rays is of the same order as that in perspex and amber.

537.226+621.315.6 3030

Dielectric Materials and Applications. [Book Review]—A. R. von Hippel (Ed.). Publishers: John Wiley and Sons, New York, and Chapman and Hall, London, 1955, 438 pp., 140 s. (*Electronic Engng*, vol. 27, p. 324; July, 1955.) Includes the MIT Tables of Dielectric Materials and gives the electrical constants of some 600 materials over a wide range of frequencies and temperatures.

MATHEMATICS

517 3031

On Spheroidal Functions—T. Aoi. (*J. phys. Soc. Japan*, vol. 10, pp. 130–141; February, 1955.) Functions are discussed which satisfy differential equations of the form

$$d/dz\{(1-z^2)(dZ\ dz)\}+(\lambda+\kappa^2\gamma^2)Z=0.$$

The analysis is relevant to the problem of scattering of em waves by spheroidal obstacles.

517.621.372.2 3032

Thq Electromagnetic Delay Line. Source of Relations between Bessel Functions and Elliptic Integrals—Prache. (*See* 2831.)

517.54:537.213:621.372 3033

Nets composed of Parts of Circles for the Approximate Solution of Field Problems—L. Tasny-Tschiassny. (*Aust. J. Phys.*, vol. 8, pp. 8–29; March, 1955.) The differential equation describing the current flow in a plane sheet can be solved approximately by a procedure in which the two-dimensional continuum is replaced by a net of straight-line-bounded meshes, leading to an electrical network of conductances. Using the methods of conformal transformation, meshes bounded by curvilinear rectangles can be similarly dealt with. A method is also developed for reducing the number of meshes without impairing the accuracy of the solutions. Two examples using nets of four meshes illustrate the method; the maximum errors are of the order of a few per cent.

MEASUREMENTS AND TEST GEAR

529.786+621.3.018.4(083.74)]:621.373.421.13 3034

[British] Post Office Quartz Oscillators for Use in Time and Frequency Standardisation Abroad—J. S. McClements. (*P.O. elect. Engrs' J.*, vol. 48, pp. 26–28; April, 1955.) The uses and principles of calibration of oscillator clocks at an observatory are discussed, and a description is given of installations carried out in the United States and Canada.

621.317.3 3035

Power Frequency Measurements—H. D. Hawkes. (*Elect. J.*, vol. 154, pp. 1366–1367; April 29, 1955.) The equipment of a standards room is briefly described. A range of measurement of 40–2,500 c/s, 5–750 V and 10 ma–5A is covered with an accuracy within 0.1 per cent by a single electronic generator, an ac-dc comparator, two transfer instruments and a frequency standard.

621.317.3:621.315.2 3036

Location of Faults in Cables—F. Nüsseler. (*Tech. Mitt. schweiz. Telegr.-TelephVerw.*, vol. 33, pp. 166–168; April 1, 1955. In German and French.) The influence of the shunt conductance of the undamaged conductor on the accuracy of fault location by the Wheatstone-bridge method is discussed.

621.317.3:[621.315.212+621.372.8 3037

Measurement of Weak Reflections in Coaxial-Line and Waveguide Systems—G. W. Epprecht and C. Stäger. (*Tech. Mitt. schweiz. Telegr-TelephVerw.*, vol. 33, pp. 143–155; April 1, 1955. In German.) Various measurement methods are described using commercially available instruments giving readings accurate to within ±0.3 per cent. Arrangements having greater accuracy are discussed. Measurements are reported on 15 different types of coaxial connectors, some of them specially designed to have low reflection coefficient and dispersion. Reflection coefficients down to 2 or 3 per cent are attainable at frequencies up to 4 kmc.

621.317.3:621.318.4 3038

Theory of Helmholtz Coils—P. Goudal. (*Rev. gén. Élect.*, vol. 64, pp. 199–202; April, 1955.) The field of the coils is calculated from the magnetic potential on the axis, which in turn is calculated using a series development of Legendre polynomials.

621.317.3:621.396.62 3039

Measurements on Radio Receivers—P. Dehmelt, E. Frommer, and W. Kronjäger. (*Arch. tech. Messen*, pp. 51–54, 77–80, 97–100; March/May, 1955.) The measurements described apply to both am and fm receivers and cover sensitivity, selectivity, frequency stability, tuning accuracy, quality of reproduction, and unwanted radiation C.C.I.R. definitions and methods are given.

621.317.3.029.64 3040

Measurements on Dielectric and Ferromagnetic Materials at Frequencies around 10 kMc/s—G. Klätte. (*Fernmeldetech. Z.*, vol. 8, pp. 256–261; May, 1955.) Complex permittivities and permeabilities are measured by means of a standing-wave indicator, the specimen being inserted into a rectangular waveguide. Results are presented in tables and graphs.

621.317.328:621.372.413 3041

Resonant-Cavity Field Measurements—S. W. Kitchen and A. D. Schelberg. (*J. appl. Phys.*, vol. 26, pp. 618–621; May, 1955.) Use of a perturbation technique [see e.g. 2265 of 1952 (Maier and Slater)] for measurements of both electric and magnetic field components is described.

621.317.332.029.55/.62 3042

Measurement of Resistance with the Measuring Junction—A. Egger. (*Fernmeldetech. Z.*, vol. 8, pp. 277–281; May, 1955.) For measurements in the frequency range 20–300 mc a device is used comprising three mutually perpendicular coaxial-line sections, one terminated by the unknown resistance, another terminated by a standard resistance, and the third leading to the supply. A rotatable coupling loop is arranged to respond to the magnetic field due to the currents in the resistance-terminated arms. Operation can be made largely automatic; an impedance plotter can be developed without much additional equipment.

621.317.34 3043

Survey of Methods in Use for Measurements on High-Frequency Cables—E. Widl. (*Fernmeldetech. Z.*, vol. 8, pp. 262–265; May. 1955.) Tables give methods of measuring characteristic impedance, internal nonuniformities, propagation coefficient, and crosstalk and transfer impedance; basic circuit diagrams are included.

621.317.361:621.374.4 3044

Frequency Multipliers and Converters for Measurement and Control—J. M. Shaull. (*Tele-Tech & Electronic Ind.*, vol. 14, Section 1, pp. 86–89, 160; April, 1955.) Circuits, mainly using double-triode tubes, are described which enable frequencies in the range 100 kc–100 mc to be compared with an error not greater than one part in $10.^{10}$ The design ensures freedom from mains hum and eliminates sidebands and phase instability. A tuned cavity unit extends the working range to 1 kmc. See also 2069 of July.

621.317.42:538.569.4 3045

Magnetic-Field Meter based on Magnetic Resonance of Protons—N. I. Leont'ev. (*Zh. eksp. teor. Fiz.*, vol. 28, pp. 77–84; January, 1955.) The instrument described makes use of the resonance absorption due to nuclear magnetic moments of protons of accurately known gyromagnetic ratio. The probe, which contains a 10 per cent solution of ferric chloride, is described in detail and the circuit is explained with reference to diagrams. Field strengths between 1,000 and 7,000 oersted are covered in three oscillator-frequency ranges between 4.25 and 30 mc. A measurement precision to within 0.006 per cent has been obtained.

621.317.7 3046
Notes on the Protection of Electrical Measurement Apparatus against Explosions—A. Ohlhans. (*Arch. tech. Messen*, No. 231, pp. 25–27; April, 1955.)

621.317.7:621.314.63 3047
Some Applications of the Nonlinear Characteristic of Germanium Crystal Diodes—Koch. (*See* 3108.)

621.317.7.029.64 3048
Ring-Shaped Waveguide Measurement Line with Automatic Visual Indication—H. Ritzl and H. Groll. (*Fernmeldetech. Z.*, vol. 8, pp. 281–286; May, 1955.) Technique developed for measurements at decimeter wavelengths [see e.g. 3198 of 1949 (Meinke)] is adapted to the centimeter band. Commercially produced apparatus is described.

621.317.725.024 3049
An Electronic D.C. Millivoltmeter—A. L. Biermasz and A. J. Michels. (*Phillips tech. Rev.*, vol. 16, pp. 117–122; October, 1954.) An instrument for measuring voltages between 1 mv and 300 v includes a vibrator for converting the direct voltage to be measured into a square-wave voltage which is amplified by an ac amplifier. The vibrator is driven by an electrodynamic system in which the coil is associated with a tube oscillator. Both the oscillator and the amplifier are operated from batteries, so that voltages can be measured between points at high potential.

621.317.729:537.291 3050
The Determination of Electron Trajectories in the Presence of Space Charge—D. L. Hollway. (*Aust. J. Phys.*, vol. 8, pp. 74–89; March, 1955.) Methods are developed for simulating clouds of distributed charge by discrete current sources in an electrolyte tank. The field patterns of charge regions of simple geometrical shapes are compared with those of sources and rules are deduced giving the dimensions and arrangement of a source array in any particular case. The method is applied to a plane diode, an axially symmetric electron beam and a general asymmetric beam, and the experimental results are compared with analytical solutions.

621.317.733:621.314.7 3051
A Bridge for Measuring Audio-Frequency Transistor Parameters—B. F. C. Cooper. (Proc. IRE, vol. 43, pp. 796–805; July, 1955.) The bridge is designed to measure the usual impedance parameters for point-contact transistors; for junction transistors the parameters measured represent a compromise between the impedance parameters and the *h* parameters derived when input current and output voltage are treated as the independent variables. The frequency of operation is 1 kc. The grounded-base connection is used for point-contact transistors and the grounded-base or grounded-emitter connection for the junction types.

621.317.75 3052
Inexpensive Wave Analyser—M. G. Scroggie. (*Wireless World*, vol. 61, pp. 360–365; August, 1955.) Analysis of the distortion products of an equipment is performed by means of a synchrodyne circuit enabling a simple low-pass filter to be used in place of the usual band-pass if system.

621.317.755.084:621.385.012.3 3053
The Characteristic-Curve Tracer, a Universal Valve Tester—C. Berthold and H. Berthold. (*NachrTech*, vol. 5, pp. 116–120, 177–179; March/April, 1955.) A cro valve tester of East German manufacture is described, intended for testing low-power tubes such as receiver types. Provision is also made for testing crystal diodes, rectifiers, gas triodes and glow lamps. The cro screen area used is 5×6 cm. Some characteristic-curve traces obtained are shown and briefly discussed.

621.397.6.001.4:535.623 3054
Color-Video Envelope-Delay Measurement—Kennedy and French. (*See* 3097.)

621.397.62.001.4 3055
Methods for Measurement of Selectivity and Delay Characteristics of Television Receivers—Griese. (*See* 3102.)

OTHER APPLICATIONS OF RADIO AND ELECTRONICS

531.717.1:621.317.39:534.232–8 3056
Thickness Measurement by Ultrasonic Resonance—E. G. Cook and H. E. VanValkenburg. (*J. acoust. Soc. Amer.*, vol. 27, pp. 564–569; May, 1955.) A mathematical analysis is presented which is applicable generally for any combinations of test specimen, coupling material and driving crystal.

621.317.39:621.376.3 3057
A Linear Capacitance-Change Circuit—Attree. (*See* 2893.)

621.365.54 3058
Power Considerations in Induction Heating—D. W. Brown. (*Electronic Engng.*, vol. 27, pp. 300–303; July, 1955.)

621.384.6 3059
Strong Focusing in [particle] Accelerators—W. Dällenbach. (*Z. Naturf.*, vol. 9a, pp. 1005–1012; December, 1954.) Stability, periodicity and maximum elongation of betatron oscillations with strong focusing are discussed. Unstable oscillations are considered; these may become significant as semistable oscillations in linear and spiral accelerators. A method of treating path deviations in synchrotrons is described. An expression more general than that of Courant *et al.* (1454 of 1953) is derived for the path expansion determining the synchrotron oscillations.

621.384.612 3060
Inelastic Diffusion of Accelerated Particles in a Synchrotron—J. Seiden and F. Lurçat. (*C. R. Acad. Sci., Paris*, vol. 240, pp. 2067–2069; May 23, 1955.) Inelastic collisons give rise to (*a*) changes in particle trajectories and (*b*) loss of energy by the particles. The mechanism of (*b*), which results in synchrotron-type oscillations, is analyzed. The theory is illustrated by investigating conditions for the Brookhaven cosmotron [821 of 1954 (Blewett)]; losses of protons due to inelastic diffusion are shown to be small.

621.384.622:681.142 3061
A Computer for solving some Problems in connection with Travelling-Wave Particle Accelerators—M. C. Crowley-Milling. (*Metrop. Vick. Gaz.*, vol. 26, pp. 127–131; April, 1955.) A mechanical system is described comprising a motor generator which, in conjunction with an amplifier and feedback system, is arranged to have an angular velocity proportional to the translational velocity of the particles.

621.385.833 3062
Reflection Electron Microscopy: Grazing Illumination, High-Angle Observation—C. Fert, B. Marty, and R. Saporte. (*C. R. Acad. Sci., Paris*, vol. 240, pp. 1975–1978; May 16, 1955.) An arrangement for observation at an angle of about 25 degrees is discussed.

621.387.424 3063
Some Characteristics of Chlorine-Quenched Geiger-Müeller Counters—A. L. Ward and A. D. Krumbein. (*Rev. Sci. Instrum.*, vol. 26, pp. 341–351; April, 1955.) Report of a comprehensive study.

621.387.424 3064
Mechanism of the Termination of the Geiger Plateau Region—H. L. Wiser and A. D. Krumbein. (*Phys. Rev.*, vol. 98, pp. 303–310; April 15, 1955.)

621.387.424 3065
Measurement of Recovery Time of Geiger-Müller Counters at the Geiger Threshold—D. Blanc. (*Nuovo Cim.*, vol. 1, pp. 504–506; March 1, 1955. In French.)

621.389:539.155.082.7 3066
Electrical Mass-Filter—W. Paul and M. Raether. (*Z. Phys.*, vol. 140, pp. 262–273; March 21, 1955.) The motion of ions in this spectrometer is in the direction of the axis in a hf electric field applied between two pairs of parallel rods symmetrically placed about the axis. A dc potential is also applied to the rods. Alternating voltages with amplitudes of the order of 1,000 v are used; a frequency range between 1.5 and 12 mc covers ion masses between 250 and 4 at optimum resolution.

621.389:539.155.082.7 3067
Transit-Time Mass Spectrometers—R. Hofmann and W. Walcher. (*Z. Phys.*, vol. 141, pp. 237–245; April 21, 1955.) A system is described in which phase focusing is reduced, with consequent reduction of bunching; this leads to a diminution of field disturbances due to space charges, and hence to improved isotope resolution.

786/789:621.37/.38 3068
Electronic Music Synthesizer—H. F. Olson and H. Belar. (*J. acoust. Soc. Amer.*, vol. 27, pp. 595–612; May, 1955.) Description of an instrument for synthesizing all types of musical sounds from a coded paper record. Use of the arrangement for producing disk records is illustrated.

PROPAGATION OF WAVES

621.396.11:551.510.535 3069
Ionospheric Self-Interaction of Radio Waves—F. H. Hibberd. (*J. atmos. terr. Phys.*, vol. 6, pp. 268–279; May, 1955.) Theory suggests that powerful modulated continuous waves reflected by the E layer should exhibit a measurable degree of self demodulation. The effect is directly proportional to the power radiated and increases with decreasing frequency in the mf and lf bands. It should be possible to deduce the electron collision frequency in the layer. Effects near the gyrofrequency are not considered.

621.396.11:551.510.535 3070
Ionospheric Self-Interaction of Radio Waves at Vertical Incidence—G. J. Aitchison and G. L. Goodwin. (*Nuovo Cim.*, vol. 1, pp. 722–725; April 1, 1955. In English.) Night-time transmissions were made from the University of Adelaide using a carrier frequency of 1.55 mc, which is close to the local gyrofrequency, modulated with af in the range 160 c/s–4 kc. The ground wave and the reflected sky wave were received at a station 5.6 km to the south. Percentage modulation was determined from measurements of received rf and af levels. Errors due to selective fading were eliminated. Similar tests were made on transmissions from broadcasting station 5CL Adelaide, 730 kc. The results show that for the 1.55-mc carrier the modulation depths of both E-reflected and F-reflected waves were significantly less than that of the ground wave, whereas there was no reduction of modulation depth for the 730-kc carrier, this frequency being remote from the gyrofrequency. A tentative explanation is advanced in terms of differential absorption of the wave components.

621.396.11:551.150.535 3071
Experiments on the Interaction of Radio Waves in the Ionosphere—M. Cutolo. (*Nuovo Cim.*, vol. 1, pp. 726–732; April 1, 1955.) De-

tailed reply to the points raised by Boella (245 of January).

621.396.11:551.510.535 3072
Measurement of the Nondeviative Absorption of Radio Waves in the Ionosphere—P. Lejay, G. Pillet, and R. Chezlemas. (*C. R. Acad. Sci., Paris.* vol. 240, pp. 1745–1748; May 2, 1955.) Hourly records of the amplitude of 1×F and 2×F echoes of 3.4-mc signals obtained at Domont are discussed; these exhibit both large fluctuations and slow variations at intervals of a few minutes. Statistical analysis based on a straightforward absorption formula indicates that these latter are due to variations of absorption as distinct from ionospheric focusing effects. Deduced hourly median values of absorption for December, 1954 and January, 1955 are shown; if a variation with zenith angle according to a cos^n law is assumed, the most likely value of n is about 0.3.

621.396.11:551.510.535 3073
Measurements of Limiting Polarization of Radio Waves reflected from the F Layer—B. Landmark. (*J. atmos. terr. Phys.*, vol. 6, pp. 284–286; May, 1955.) Measurements made at Kjeller, in Southern Norway, during May, 1954, on F-layer echoes at near-critical frequency, do not confirm a previous suggestion that such echoes are linearly polarized.

621.396.11.029.53/.55:551.510.535 3074
Experimental Results of Oblique-Incidence Pulse Transmissions via the Ionosphere—F. Delobeau, R. Eyfrig, and K. Rawer. (*Ann. Télécommun.*, vol. 10, pp. 55–64; March, 1955. Transmissions between fixed stations in Europe, North America, and West Africa were observed using a technique which determined the propagation time. Between Freiburg and Dakar (4730 km), winter reception on both 11.4 mc and 18.6 mc was by multiple-hop F-layer propagation; mixed E-and F-layer propagation was important on 11.4 mc; in summer, mixed-layer propagation at this frequency was observed only in the evening. Between Florida and Dakar (7,000 km) propagation at 1.95 mc occurs only at night, in winter by multiple-hop E reflections; in spring and summer F reflections are occasionally received. Absorption in the D region prevents day-time propagation. Results are similar for transmission between the Faroes and Freiburg (1,500–1,700 km) on 1.95 mc, but here E_s reflection is important. Observations of F_2-layer propagation over a 1,216-km ground path suggest that the "M 3,000" factor of the C.R.P.L. forecasts is really an "M 2,700" factor and that predicted values for muf are too low.

621.396.11.029.55/.62:551.510.535 3075
A Note on Factors affecting the Interpretation of Observations of Transient Echoes from the Ionosphere—C. A. Shain and F. J. Kerr. (*J. atmos. terr. Phys.*, vol. 6, pp. 280–281; May, 1955.) In the frequency range 10–100 mc the echo rate determined by a receiver is inversely proportional to the square root of the cosmic-noise intensity. A correction is therefore necessary in observations of echoes from meteor-trail ionization to allow for the diurnal variation of cosmic noise. The effect may be used to determine the height at which increased absorption occurs in sudden ionospheric disturbances.

621.396.11.029.63/.64 3076
Reflection Coefficients of Irregular Terrain at 10 cm—E. M. Sherwood and E. L. Ginzton. (Proc. IRE, vol. 43, pp. 877–878; July, 1955.) Report of observations made in 1943, of reflections from homogeneous samples of various types of surface, including salt and fresh water, dry sand and soil, moist sand, dry soil with vegetation, and ice.

621.396.81:551.510.535:523.78 3077
A Note on Radio Field Strength Observations made at Ahmedabad during the Total Solar Eclipse on 30 June 1954—R. G. Rastogi and R. M. Sheriff. (*J. sci. industr., Res.*, vol. 14A, pp. 159–161; April, 1955.) Measurements on 15.07-mc transmissions from London are discussed. Field strength is shown plotted against time of day for the eclipse day and for preceding and following control days. The most probable mode of propagation was the two-hop mode via the F_2 layer. An observed increase of signal strength during the eclipse period is probably due to decreased absorption in the lower layers of the ionosphere, mainly the F_1 layer.

621.396.812.3 3078
Probability of Fluctuations in Links between Points within the Visible Range—T. Baldi. (*Ricerca sci.*, vol. 25, pp. 808–827; April, 1955.) Analysis is presented for conditions in which a strong ground-reflected ray is to be expected. An expression is derived for the probability of the attenuation of the reflected ray exceeding a given amount relative to the direct ray, assuming random variation of the refractive-index gradient g. A formula established for the probability density of g is used to plot curves for comparison with experimental results.

RECEPTION

621.396.62:621.317.3 3079
Measurements on Radio Receivers—Dehmelt, Frommer and Kronjäger. (*See* 3039.)

621.396.621.54 3080
A High Performance Battery Receiver—(*Mullard tech. Commun.*, vol. 2, pp. 17–27; April, 1955.) Details are given of a 7-tube superheterodyne receiver covering the frequency range 545 kc–24 mc in four bands; it has one rf stage and a push-pull output stage delivering 425 mw for a voltage of 90 v and 1.2 w for 135 v.

621.396.621.54:621.314.7 3081
Multi-stage Transistor Superheterodyne—C. L. Wright. (*Short Wave Mag.*, vol. 13, pp. 69–75; April, 1955.) An all-transistor receiver designed to cover the 160-m and 80-m amateur bands is described in detail. Both point-contact and junction type transistors are used. The circuit comprises rf stage, Clapp local oscillator, mixer, two if stages operating at 465 kc, detector voltage-doubler comprising two diodes, Clapp beat-frequency oscillator, grounded-collector af matching stage, phase inverter and Class-B push-pull output stage. Complete circuit diagrams and tables of recommended components are given. Experiments are also very briefly mentioned on the application of magnetic bias for extending the frequency range of transistors to 30 mc and on the development of a special mixer transistor with two emitters.

621.396.621.54.029.62:621.376.3 3082
Band-II F.M. Tuner Unit—L. Hampson. (*Wireless World*, vol. 61, pp. 368–374; August, 1955.) Details are given of a design having one rf stage, oscillator-mixer, two if stages and ratio detector, suitable for use with a wide range of af amplifiers, including that described in 2245 of August (Ferguson).

621.396.828:621.316.8 3083
Resistors for Radio-Interference Suppression in Otto-Cycle [internal-combustion] Engines—H. Henniger. (*NachrTech.*, vol. 5, pp. 166–170; April, 1955.) The characteristics of various types of resistor are discussed. At present the inorganic solid-body resistor is the only type satisfying the requirements in respect of frequency, dielectric strength, temperature characteristics and absence of oxidation at high temperatures. A 5-10-kΩ, ½-w resistor, of dimensions 3.5×16 mm, is suitable in most applications; it may be incorporated in the spark plug. The discussion also mentions the applications of *LCR* suppressors and of damped λ/2 or λ/4 lines.

STATIONS AND COMMUNICATION SYSTEMS

621.376.5:621.39.001.1 3084
A Comparison between Delta and Pulse Code Modulation—L. H.Zetterberg. (*Ericsson Tech.*, vol. 11, pp. 95–154; 1955.) Analysis is made on the basis of information theory, and with reference to the quality of speech transmission. The delta and pcm systems have about equal information-transmitting capacity for an equal and reasonably large number of distinguishable signal levels. The amplitude distribution of the ideal signal for the delta system implies a signal power about 60 per cent less than for the corresponding pcm signal. The delta-modulation signal exhibits a spectral distribution in which the density decreases with increasing frequency. The two principal types of fault are overloading and granulation. For optimum signal/noise ratio, the delta system needs a much larger bandwidth than pcm for moderate or high quality.

621.376.55:621.396.822.1:621.3.018.78 3085
Low-Frequency Crosstalk in Pulse-Phase Modulation—J. G. Little. (*Wireless Engr.*, vol. 32, pp. 220–223; August, 1955.) Conditions are considered for the passage of pulses through a single distorting network such as a coupling or decoupling circuit. The method of analysis is discussed in which the effect of low-frequency distortion on each component of the spectrum of a modulated pulse train is examined. A preferred method is to consider the waveform of a single pulse and to sum the effects of a series of disturbing pulses on a given disturbed pulse. The results give an indication of the order of low-frequency response necessary for the attainment of a given quality of transmission.

621.395.43:621.376.56 3086
Pulse-Code-Modulation Multiplex Telephone Transmission System—P. Herreng, R. Blondé, and G. Dureau. (*Câbles & Transm.*, vol. 9, pp. 144–160; April, 1955.) Equipment designed by the Société Alsacienne de Constructions Mécaniques uses binary coding effected by a cr tube of special construction; preliminary 32-level quantization of the signal is effected by a method eliminating feedback with consequent advantages in coding speed. The signal transmitted is a five-pulse combination. Decoding is performed by comparing the stored received signal with a complete pulse sequence identical with that generated at the transmitter, using a specially constructed coincidence detector.

621.395.44:621.315.052.63 3087
Guide to Application and Treatment of Channels for Power-Line Carrier—(*Trans. A.I.E.E.*, Part III-A, *Power Apparatus and Systems*, vol. 73, pp. 417–435; June, 1954. Discussion, pp. 435–436.) A committee report presenting data and discussion relevant to the development of adequate and reliable carrier-current channels.

621.396.41:621.396.65 3088
Protection of Service in the TD-2 Radio Relay System by Automatic Channel Switching—I. Welber, H. W. Evans and G. A. Pullis. (*Bell Syst. Tech. Jour.*, vol. 34, pp. 473–510; May, 1955.) One of the six two-way channels is reserved for use as a substitute in case of interruption or severe degradation of transmission in the other channels. The operation and circuits of the protection system are described in detail.

621.396.41:621.396.82 3089
Interchannel Interference in FM and PM Systems under Noise Loading Conditions—W. R. Bennett, H. E. Curtis and S. O. Rice. (*Bell Syst. Tech. Jour.*, vol. 34, pp. 601–636; May, 1955.) Frequency-division systems with

a large number of channels are considered and analysis is given using a band of random noise to represent the multiplex signal. Interchannel interference due to variation of attenuation and phase shift with frequency is estimated from the effect produced by echoes of relatively small amplitude. Curves are presented for computing the interference power.

621.396.66 3090

Operational Measurements on U.S.W. [f.m.] Broadcast Transmitters: Part 3—L. Merkl. (*Arch. tech. Messen*, pp. 31–32; February, 1955.) Noise measurements are discussed. Parts 1 and 2: 1789 of June.

621.396.66 3091

Comparative Measurements with Volume-Meter and Peak-Value Meter for Monitoring Broadcast Transmissions—E. A. Pavel, A. Gastell and M. Bidlingmaier. (*Fernmeldetech. Z.*, vol. 8, pp. 205–212; April, 1955.) The comparison shows that for monitoring modulation depth the peak-value meter is more satisfactory. For high accuracy the integration time of the meter should be $\not>$10 ms.

SUBSIDIARY APPARATUS

621.311.6:621.314.63:546.28:535.215 3092

Silicon Solar-Energy Converters—M. B. Prince. (*J. appl. Phys.*, vol. 26, pp. 534–540; May, 1955.) Theory of operation of the Si junction photodiode is given and compared with experimental data. Si is shown to be the most efficient semiconductor available for conversion of solar energy. A design is discussed in which the radiation is incident on the *n* layer; the thickness of the *p*-layer is required to be low to give low resistance, but not so low that minority carriers recombine before diffusing to the junction. Resistance at the metal contacts must be kept as low as possible. Conversion efficiencies of 6 per cent have been attained. Possibilities are indicated of improving the efficiency by use of nonreflecting coatings or auxiliary mirrors and lenses.

621.311.62:621.316.722.1 3093

Regulated D.C. Power Supplies at Low Voltages—R. K. Hayward, J. C. Jennings, and R. C. Barker. (*Electronic Engng.*, vol. 27, pp. 304–307; July, 1955.) A tube-stabilized unit with dc output 250 ma at 50 v or 150 ma at 100 v is described, as well as a unit using Ge-junction rectifiers. The limitations of cold-cathode-tube stabilizers are discussed.

TELEVISION AND PHOTOTELEGRAPHY

621.397.26 3094

The London-Isle-of-Wight Television Link, Stage One—T. Kilvington. (*P.O. elect. Engrs' J.*, vol. 48, Part 1, pp. 36–38; April, 1955.) "The initial television service to the Isle of Wight has been provided by direct pick-up of signals from the London transmission on receivers sited near Alton, Hants, and thence by transmission over a 40-mile microwave link to Rowridge, I.o.W., where it is radiated from a B.B.C. transmitter."

621.397.5:535.623 3095

Transmitting Colour Information—(*Wireless World*, vol. 61, pp. 393–396; August, 1595.) The effects on transmitting and receiving techniques of modifications to the American N.T.S.C. system incorporated in the experimental "British N.T.S.C." system are explained. The system envisaged by the B.B.C. has the advantage that the same transmissions will cater both for simple receivers recovering narrow-band signals and for more elaborate receivers recovering wide-band signals and giving high-definition color reproduction. See also *ibid.*, p. 355, for details of the standards used by the B.B.C.

621.397.6 3096

New Design in Closed-Circuit Television—A. V. J. Martin. (*Tele-Tech & Electronic Ind.*, vol. 14, Section 1, pp. 94–96, 133; April, 1955.) English version of article noted in 1499 of May.

621.397.6.001.4:535.623 3097

Color-Video Envelope-Delay Measurement—R. C. Kennedy and H. French. (*Electronics*, vol. 28, pp. 144–148; June, 1955.) Description of a test set, comprising transmitter and calibrated distant receiver, and technique for dedetermining the phase-shift of the N.T.S.C. color-picture signal.

621.397.611.2 3098

Development and Operation of the Riesel-iko [supericonoscope with stabilizing electron spray]—F. Michels. (*Fernmeldetech. Z.*, vol. 8, pp. 269–272; May, 1955.) A tube operating on the principles described e.g. by Cope et al. (2632 of 1952) is discussed. Spurious picture signals are eliminated by generating a space charge of required density and by providing border electrodes. A method is also described for suppressing hum interference produced when the photocathode supplying the electron spray is illuminated by pulsating sources.

621.397.62:535.623 3099

Designing TV Tuners for Color Receivers—F. Schor. (*Tele-Tech & Electronic Ind.*, vol. 14, Section 1, pp. 80–81; 154; April, 1955.) The effects of unevenness of response curve, mismatching and oscillator frequency drift are discussed. If oscillator drift is <60 kc a tuner correctly designed for monochrome reception will give good results for color television, but tuning is more critical.

621.397.62:535.623:535.88 3100

Large-Screen Color-Television Projection—L. L. Evans and R. V. Little, Jr. (*J. Soc. Mot. Pict. Televis. Engrs*, vol. 64, pp 169–173; April, 1955. Discussion, p. 173.) Description of apparatus producing a picture 15 feet×20 feet and operating on F.C.C. standards.

621.397.62:535.88 3101

A Design for Scanning and E. H. T. Generators to Operate a Television Projection System from 170-V H. T. Supply—E. F. Wale. (*J. Brit. IRE*, vol. 15, pp. 315–326; June, 1955.) The design of a receiver without a mains transformer is discussed. The most practical method is to combine high-voltage pulses from the line output circuit and from a separate hv generator. Details are given of a timebase unit with two hv rectifiers providing an output of 25 kv over a current range 0–250 μa. A comparison of components used shows that a considerable reduction in the cost of production as against that of a conventional circuit should be realized.

621.397.62.001.4 3102

Methods for Measurement of Selectivity and Delay Characteristics of Television Receivers—H. J. Griese. (*Arch. elekt. Übertragung*, vol. 9, pp. 167–170; April, 1955.) Methods are described for determining group delay and phase characteristics without modifying the receiver under test.

621.397.621.2:535.623:621.385.832 3103

Development of the RCA 21-Inch Metal-Envelope Color Kinescope—H. R. Seelen, H. C. Moodey, D. D. VanOrmer, and A. M. Morrell. (*Elect. Engng, N. Y.*, vol. 74, pp. 330–335; April, 1955.) See 2771 of September.

621.397.8 3104

Television Picture Definition—W. Dillenburger. (*Fernmeldetech. Z.*, vol. 8, pp. 213–221; April, 1955.) A circuit is described for correcting the frequency characteristic of the pick-up tube so as to maintain the picture definition at 100 per cent for video frequencies up to 5 mc, as required for the C.C.I.R. 625-line system. Tests with a supericonoscope and with a superorthicon are reported; the improvement due to the equalizer was noticeable on test transmissions but not on programme transmissions. The effect on signal/noise ratio of using the equalizer was also investigated.

621.397.8:535.623 3105

Flicker in Frame Sequences in Television—P. Billard. (*Rev. d'Optique*, vol. 34, pp. 129–149; March, 1955.) Experiments were made to determine the characteristics of a color-television system combining the greatest possible bandwidth economy with absence of perceptible flicker; the persistence of red, green, and blue phosphors was simulated by an appropriate lamp-and-filter system in conjunction with graded-density film. The critical repetition frequency depends little on the type of scanning sequence used; for the relatively-short-persistence blue it is much lower than for the relatively-long-persistence red and green; for the latter, visible flicker is suppressed at 43 frames /sec at a luminance level of 30 nt. Red and green signals should receive equal treatment, whether with simultaneous or with binary alternating presentation.

TUBES AND THERMIONICS

537.5:538.56 3106

Plasma Ion Oscillations in Electron Beams—K. G. Hernqvist. (*J. appl. Phys.*, vol. 26, pp. 544–548; May, 1955.) "The frequency of the oscillations observed in ion-neutralized electron streams such as that of an ion-trapping gun or of a tetrode has been shown to agree well with the Langmuir-Tonks theory for plasma ion oscillations. The existence of a dipole mode of oscillation in addition to the longitudinal mode has been observed for a plasma column. A mechanism is proposed for the excitation of these self-sustained oscillations by which the secondary electron current from electrodes bounding the plasma is modulated by the vibration of the ions in such a way as to deliver energy to the ac field associated with the ion oscillations. Experimental observations verify this picture as far as the source of energy is concerned."

621.314.63:535.215 3107

"Gate Modulation" of Electromagnetic Radiation—K. Lehovec. (*J. appl. Phys.*, vol. 26, pp. 495–496; May, 1955.) The space-charge region in the vicinity of a semiconductor *p-n* junction acts as a gate for light incident parallel to the plane of the junction, the gate width depending on the value of an applied blocking voltage. The effect is based on the dependence of the semiconductor absorption on the concentration of free carriers. A proposal to use the principle in the construction of an infrared diffraction grating is mentioned.

621.314.63:621.317.7 3108

Some Applications of the Nonlinear Characteristic of Germanium Crystal Diodes—P. Koch. (*Bull. schweiz. elektrotech. Ver.*, vol. 46, pp. 361–372; April 16, 1955.) The theoretically predicted logarithmic characteristic has been confirmed in commercial diodes. Square-law or other desired special characteristics are obtained by combining diodes. Descriptions are given of a ratiometer and of a modulator designed on the basis of these characteristics. Noise voltage is 5–8 times as great as the value calculated from the diode resistance, with loads up to about 150 mv per diode.

621.314.7 3109

The Transistor: Part 5—Properties and Limitations—J. R. Tillmann and F. F. Roberts. (*P. O. elect. Engrs' J.*, vol., 48, Part 1, pp. 43–47; April, 1955.) The properties are explained in terms of the transistor structure. Production techniques for improving frequency range, switching speed, power capacity, reliability and ability to operate at high temperature are discussed. Part 4: 2464 of August (Yemm and Carasso).

621.314.7 3110

A Two-Emitter Transistor with a High Adjustable Alpha—R. F. Rutz. (PROC. IRE, vol. 43, pp. 834–837; July, 1955.) The enhancement of the current amplification of a point-contact transistor on adding a second emitter is attributed to internal positive feedback which varies the hole-transport factor associated with the second emitter as the first-emitter current is varied. The effect of varying the spacing between second emitter and collector is also discussed and experimental results are reported.

621.314.7 3111

The Effects of Junction Shape and Surface Recombination on Transistor Current Gain: Part 2—K. F. Stripp and A. R. Moore. (PROC. IRE, vol. 43, pp. 856–866; July, 1955.) Continuation of work reported by Moore and Pankove (2797 of 1954). Analytical expressions are derived for the collector-to-base current amplification factor, taking account of surface and volume recombination, for grown-junction transistors with rectangular and round cross section and for alloyed-junction types. The expressions become simpler when volume recombination is neglected, which is justifiable in most practical cases. Parameters involved including a geometrical figure of merit, are evaluated for alloyed-junction types, using a three-dimensional electrolytic analog. The highest figure of merit is obtained by combining a flat emitter junction with a collector penetrating not less than a critical distance into the base.

621.314.7:621.317.733 3112

A Bridge for measuring Audio-Frequency Transistor Parameters—Cooper. (*See* 3051.)

621.314.7:621.372.5 3113

Design Considerations of Junction Transistors at Higher Frequencies—R. A. Pucel. PROC. IRE, vol. 43, pp. 878–879; July, 1955.) Theory given previously [583 of February (Statz et al.)] is extended to derive a form of the equivalent T network applicable down to zero frequency.

621.314.7:621.396.621.54 3114

Multi-stage Transistor Superheterodyne—Wright. (*See* 3081.)

621.38.032.7.002.2 3115

Ceramic-to-Metal Sealing: its Development and Use in the American Radio Valve Industry—D. E. P. Jenkins. (*Electronic Engng*, vol. 27, pp. 290–294; July, 1955.) A review of literature. 55 references, including patents and special reports.

621.383.2 3116

Behaviour of Vacuum Photocells illuminated by Light Pulses—W. Kluge and S. Weber. (*Z. angew. Phys.*, vol. 7, pp. 126–131; March, 1955.) Ag-Cs_2O-Cs and SbCs-Cs photocells were illuminated by single and repeated light pulses of duration about 17 μs at an intensity up to 4.9×10^7 lux. The former showed no signs of fatigue until the mean cathode current exceeded a value between 1 and 5 $\mu a/cm^2$, the value depending on the particular cathode structure. Recovery could be accelerated by means of infrared illumination. The transparent SbCs-Cs photocells were found to be less suitable in light-pulse applications.

621.383.27 3117

Theory of Operation of the Last Stage of a Photomultiplier—P. Leuba. (*J. Phys. Radium*, vol. 16, pp. 296–303; April, 1955.) Assuming constancy of photocathode sensitivity and of multiplication factor, linearity is achieved in the final stage by making the time constant of the associated circuit large compared with the duration of the input pulse and by ensuring that all electrons emitted by the final dynode reach the collector electrode. To achieve this it is necessary that the final stage is not space-charge limited, that the transit time of electrons across it is small compared with the pulse duration, and that the pulse shape is regular.

621.385:621.396.822 3118

Investigations of Electron Streams—J. Müller. (*Z. angew. Math. Phys.*, vol. 5, pp. 203–232, 409–419; May 15/September 15, 1954.) Phenomena in controlled beams are analysed by means of perturbation theory based on the laws of conservation of energy and charge. Matrix formulation is used. Nyquist's noise formula is derived for a system in thermal equilibrium, with a potential minimum in the beam and large transit angles. Noise formulas are also presented for a system not in thermal equilibrium.

621.385:621.396.822 3119

Cross Correlation between Velocity and Current Fluctuations in Tube Noise—S. V. Yadavalli. (*J. appl. Phys.*, vol. 26, pp. 605–608; May, 1955.) Correlation between the velocity and current fluctuations in an electron stream at the entrance plane is shown to be zero under stated conditions. See also 301 of January.

621.385.029.6 3120

Backward-Wave Oscillator Efficiency—R. W. Grow and D. A. Watkins. (PROC. IRE, vol. 43, pp. 848–856; July, 1955.) "The dependence of power output upon space charge, circuit loss, beam thickness, velocity spread, and circuit mismatches is determined by a combination of theoretical and empirical means. In addition, the effect of circuit mismatches upon the starting current and frequency is discussed."

621.385.029.6 3121

Variation of High-Frequency Admittance of a Multi-segment Magnetron in the Oscillating State—H. Fricke. (*Fernmeldetech. Z.*, vol. 8, pp. 186–192; April, 1955.) The operation of the magnetron is explained in relation to an approximate calculation of the admittance diagram. Discussion of the electron paths is referred to a plane equivalent system in which the bunched electrons interact with the hf field only in the vicinity of the slots. Both capacitive and inductive reactances may occur. As the anode voltage is varied, the resistive and reactive admittance components vary simultaneously, producing variations of both amplitude and frequency of the oscillations. The influence on the admittance of the magnetic field, the oscillation mode, and the number of slots is also indicated. The theoretical results are supported by measurements and by results of other workers.

621.385.029.6:621.3.012 3122

Graphical Determination of Reflex-Klystron Characteristics—J. Bruijsten. (*Phillips Res. Rep.*, vol. 10, pp. 81–96; April, 1955.) A triangular diagram of normalized efficiency as a function of resonator loss conductance, load conductance and small-signal electronic conductance is derived from the variation of normalized efficiency with bunching parameter. Conditions under which the diagram is valid are discussed; it can be used for constructing curves relating the power parameter to the electronic tuning parameter for nonreactive and reactive loads, or alternatively for evaluating the parameters from experimental data.

621.385.029.6:621.396.822 3123

Noise in One-Dimensional Electron Beams H. A. Haus. (*J. appl. Phys.*, vol. 26, pp. 560–571; May, 1955.) Conditions in long-beam microwave tubes are considered; general theory of the noise in such beams is developed based on use of a reference plane other than that of the beam potential minimum and selected so that the assumption of uniform transverse distribution of electron velocity is valid at and beyond this plane. Analogies with network theory are used in the analysis; transformations of the noise standing wave by means of "lossless beam transducers" constituted by the region between the reference plane and the drift space are discussed. Expressions are derived for the minimum obtainable noise figures of a velocity-jump amplifier, a klystron and a traveling-wave tube. It is shown that these noise figures cannot be reduced by using "lossy beam transducers."

621.385.029.65 3124

A Tunable, Low-Voltage Reflex Klystron for Operation in the 50–60 kMc/s Band—E. D. Reed. (*Bell Syst. Tech. Jour.*, vol. 34, pp. 563–599; May, 1955.) A detailed description is given of the Type-M1805 tube, which delivers cw power of 15–30 mw at a beam voltage of 600 v and has a mechanical tuning range >10 kmc. Features specially studied include the high-convergence gun and the development of an efficient passive circuit consisting of cavity and wide-band output coupling system. Grids used at the interaction gap are of tungsten ribbon with a thickness transverse to the beam of 0.0003 inch and a width of 0.003–0.004 inch in the direction of electron flow. The tube is free from electron hysteresis, indicating either that few electrons reach the interaction gap for a third time or that those which do are no longer bunched.

621.385.032.216 3125

Improved "Impregnated Cathode"—R. Levi. (*J. appl. Phys.*, vol. 26, p. 639; May, 1955.) Improvements in the cathode described in *Le Vide*, vol. 9, pp. 284–289; November, 1954, are indicated.

621.385.2+621.385.029.6 3126

Noise at the Potential Minimum in the High-Frequency Diode—D. A. Watkins. (*J. appl. Phys.*, vol. 26, pp. 622–624; May, 1955.) Analysis is presented based on the assumption that the transit angle between cathode and potential minimum is small compared with that between potential minimum and anode. The mean-square convection current is found to be about half full shot noise for a typical case and the mean-square velocity is found to be the same as in the temperature-limited case. Application of this result to an analysis of the minimum obtainable noise figure of klystrons and traveling-wave tubes using velocity-jump noise reduction shows that their noise figure can be reduced without theoretical limit by increasing the current density at the cathode.

MISCELLANEOUS

621.37/39].004.6:623 3127

Maintainability of Services Equipment—(*J. Brit. IRE*, vol. 15, pp. 283–307; June, 1955. Discussion, pp. 307–313;) Part 1 (pp. 307–313.) Part 1 (pp. 283–290)—G. W. A. Dummer. Summarized analysis of faults in electronic equipment reported to the Ministry of Supply during the period 1950–1953, and discussion of design and constructional techniques for improving reliability and ease of maintenance. Part 2 (pp. 290–298)—R. B. Brenchley. Part 3 (pp. 299–300)—G. C. Godfrey. Part 4 (pp. 303–307)—A. J. B. Naish. Outline descriptions of Army, Royal Air Force, and Royal Navy maintenance systems and equipment design and test requirements.

621.38:53 3128

Advances in Electronics and Electron Physics, Vol. VI. [Book Review]—L. Marton (Ed.). Publishers: Academic Press, New York, 1955, 518 pp., $11.80. (PROC. IRE, vol. 43, p. 898; July, 1955.) Surveys are presented of metallic conduction at high frequencies and low temperatures, relaxation processes in ferromagnetism, physical properties of ferrites, space-charge-limited currents, comparison of analogous semiconductors and gaseous electronic devices, the electron microscope, traveling-wave tubes and paramagnetism.

Gulton abstracts

11

MATERIALS RESEARCH • ELECTRONIC COMPONENTS • PRECISION INSTRUMENTS • SYSTEMS ENGINEERING

New Shock and Vibration Test Set Provides Vital Data for Tube Design

Design engineers, previously restricted by lack of adequate equipment and a prohibitive time factor, can now obtain rapid, accurate, and easily-interpreted information essential to assure reliability of tubes in equipment which will be subjected to severe environmental conditions in transit and general use.

This has been made possible by a new test set for the measurement of shock and vibrations applied to electron tubes in military electronic equipment, developed by Gulton Mfg. Corp. in conjunction with the U. S. Army Signal Corps Engineering Laboratories.* This equipment has extremely useful application for tube and chassis manufacturers, testing laboratories, and development engineers.

Under development for several years, this new GLENNITE Accelerometer Test Set features accelerometers containing three orthogonal sensitive elements as well as electronic techniques for the instantaneous vectorial addition of unidirectional signals. GLENNITE accelerometers provided with the set approximate the size and weight of all standard electron tubes and are directly plugged into the tube sockets on a test chassis.

Capabilities of this instrument in its specific field are virtually limitless:

1. *The tube designer and manufacturer can determine shock and vibration data to be used as a basis for tube design.*
2. *The test set can determine whether tube failure results from internal defects or excessive environmental strain.*
3. *Information to establish the proper tube location on a chassis for achieving optimum protection is provided to the equipment designer.*
4. *The chassis designer can improve the shock resistance and ruggedization characteristics of his equipment by mechanical strengthening or acceleration isolation.*
5. *The test set provides a means of ascertaining the effectiveness of various techniques of shock and vibration isolation.*

An outstanding advantage of the new device is its simplicity of operation. Semi-skilled technicians can use it without the necessity of employing any other laboratory device, and the entire operation is completely automatic once the initial adjustments are made.

Available in two different models, this system measures the one axial and two lateral acceleration components sensed by the tube-shaped accelerometers mounted on the test chassis. Automatic switching techniques provide for the measurement of each accelerometer for one minute in turn, and the outputs are recorded directly on graph paper, thus providing a permanent record of the test in direct g readings.

Model KA-20, which includes a 4-channel recorder and sampling selector, automatically monitors 20 accelerometer outputs in 10 minutes, while the Model KA-21, a 2-channel version, measures 10 accelerometer outputs in the same time.

The full scale range of the new system is from 5 to 100 g's, with a reading as low as ½ g possible. Frequency response is from 5 to 5000 cps, and accuracy for the overall system is ± 10%.

Inquiry on your shock and vibration problems is welcomed. For further information, write:

Gulton Mfg. Corp.
Metuchen, New Jersey

---

*Contract No. DA 36-039-SC 42716

Nuclear Research Service Aims for Improvement of Materials Characteristics

The improvement of electrical, mechanical, and chemical characteristics of materials for industry by means of irradiation marks the first step in a new nuclear energy expansion program now established by the Glenco Corporation.

To implement this operation, Glenco has assembled a highly-skilled staff of physicists and research engineers in order to provide industry with a complete service for investigations of radiation effect on materials having dielectric or piezoelectric properties, including barium titanate.

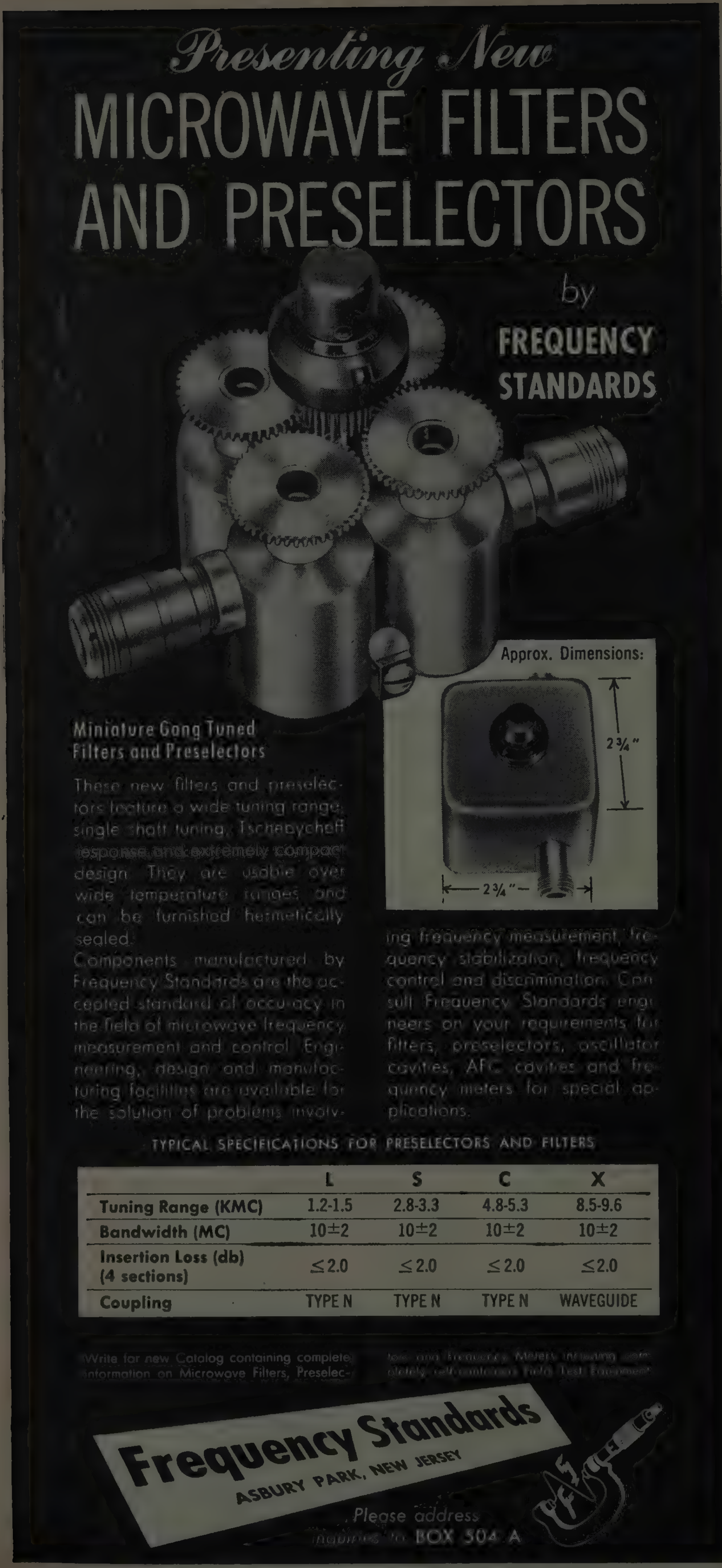
In the past, experiments have shown that the electrical resistivity characteristics of dielectrics can be improved, and that increased para-magnetism of metallic oxide can be obtained through radiation. In addition, increased strength and resistance to thermal change of polyethylene, and increased tensile strength and hardness of stainless steel have also been noted.

Analysis and evaluation of property changes are performed both during and after radiation, using controlled sources such as thermal neutrons and very high energy gamma rays; and tracer analysis work—wherein isotopes of atoms in compounds under investigation are "tagged," and reactions then studied by means of counter techniques—also form a part of the complete service. In addition, the study of radiation effects on organic and inorganic materials over a given period of time can be accomplished.

And, of course, an inherent part of the entire service is Glenco's renowned reputation for integrity and quality performance. Interested? Call or write us for more information about how you can improve your product by putting nuclear energy to work in your industry.

Glenco Corporation
Metuchen, New Jersey

Published by
GULTON INDUSTRIES, INC.
Comprising: Gulton Mfg. Corp. • Glenco Corporation • Vibro-Ceramics Corporation
Greibach Instruments Corporation • Thermistor Corporation of America


Presenting New

MICROWAVE FILTERS AND PRESELECTORS

by

FREQUENCY STANDARDS

Miniature Gang Tuned Filters and Preselectors

These new filters and preselectors feature a wide tuning range, single shaft tuning, Tschebycheff response and extremely compact design. They are usable over wide temperature ranges and can be furnished hermetically sealed.

Components manufactured by Frequency Standards are the accepted standard of accuracy in the field of microwave frequency measurement and control. Engineering, design and manufacturing facilities are available for the solution of problems involving frequency measurement, frequency stabilization, frequency control and discrimination. Consult Frequency Standards engineers on your requirements for filters, preselectors, oscillator cavities, AFC cavities and frequency meters for special applications.

TYPICAL SPECIFICATIONS FOR PRESELECTORS AND FILTERS

	L	S	C	X
Tuning Range (KMC)	1.2-1.5	2.8-3.3	4.8-5.3	8.5-9.6
Bandwidth (MC)	10±2	10±2	10±2	10±2
Insertion Loss (db) (4 sections)	≤2.0	≤2.0	≤2.0	≤2.0
Coupling	TYPE N	TYPE N	TYPE N	WAVEGUIDE

Write for new Catalog containing complete information on Microwave Filters, Preselectors and Frequency Meters including completely self-contained Field Test Equipment.

Frequency Standards
ASBURY PARK, NEW JERSEY

Please address inquiries to BOX 504 A

News–New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your I.R.E. affiliation.

(Continued from page 102A)

Elgin Names Jonson Sales Supervisor

Elgin National Watch Co., Elgin, Ill., announces the appointment of Donald Jonson, former sales representative for the company's Wadsworth-Hadley division, as sales supervisor in the electronics division.

The appointment was announced by E. C. Carlson, division sales manager.

Jonson will coordinate work in sales of microphone and relay products for Elgin's West Coast Electronic subsidiaries.

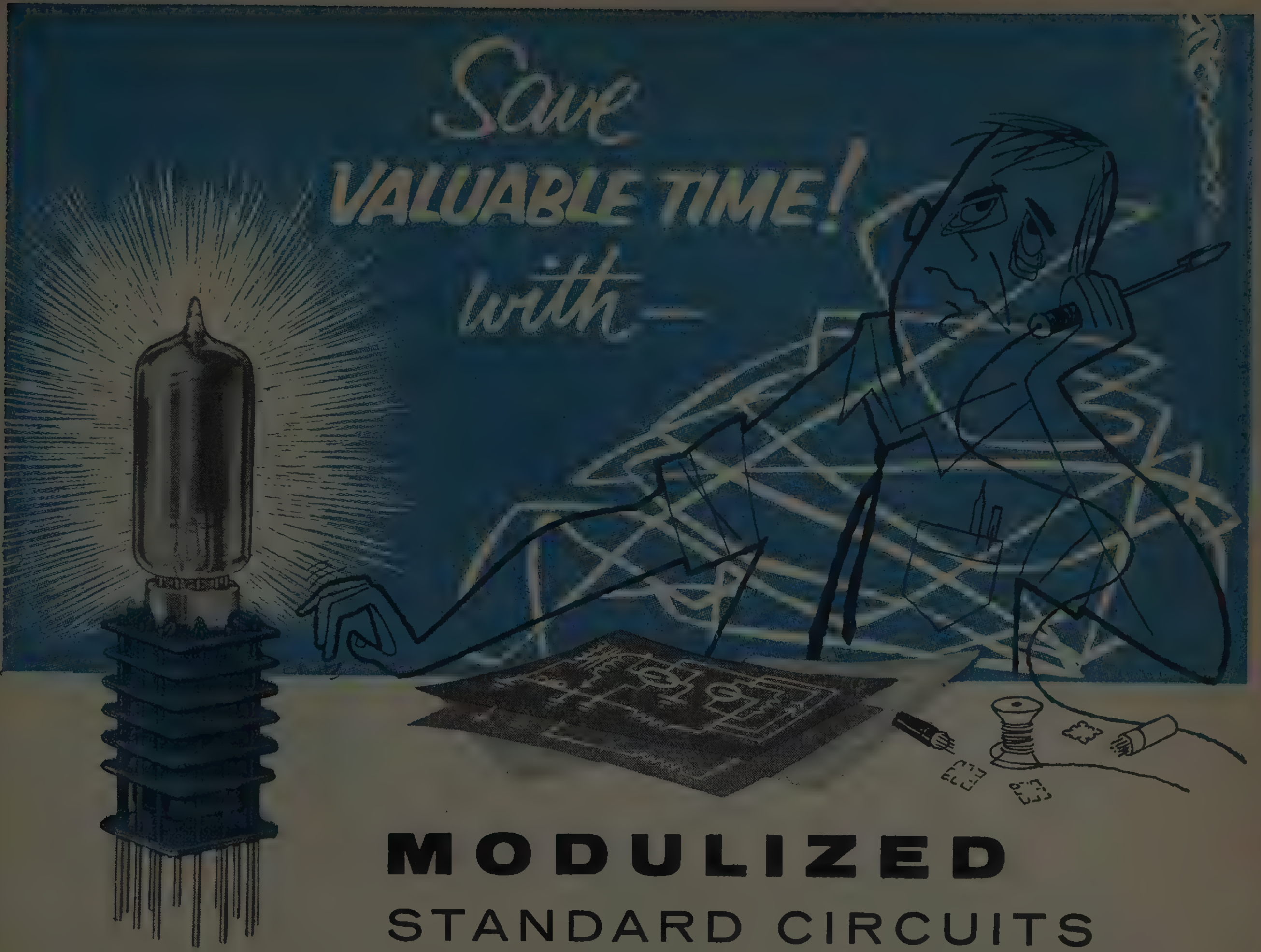
These are American Microphone Co. of Pasadena, Calif., Elgin-Neomatic, Inc., of Los Angeles, and Advance Relay Co. of Burbank.

New Servo

OSTER
CO.
Oster
SERVO CONTROL
TYPE 2U-2287

A new high temperature size 15, 400 cps, servo motor which also meets Mark 7 specifications is now offered by the **John Oster Manufacturing Co.,** 1 Main St., Racine, Wis. Operating temperatures up to 150°C continuous 1000 hour ambients have been attained. Extremely small air gap results in top performance for a high torque-to-inertia ration. Humidity protection is given by encapsulating the entire stator in a thermosetting resin to meet MIL-E-5272A. Series 2287 has stainless steel ball bearings and meets MIL-S-17087 specs. Dimensions are 1.437 OD×1.640 inches L. Weight is 8 ounces, minimum stall torque 1.45 inch/ounces,

(Continued on page 108A)

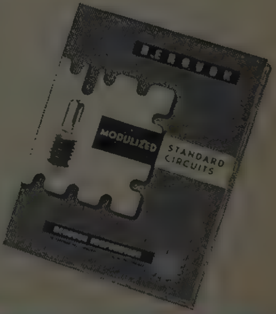

Save
VALUABLE TIME!
with—

MODULIZED
STANDARD CIRCUITS

Why fuss and fume over basic circuit details? That's the technician's, not the engineer's job, when dealing with standard circuitry. There's more important, more profitable, more rewarding work to do in **creative design.**

Which accounts for Aerovox Modulized Standard Circuits. Block diagrams are reduced to functional units that plug or otherwise connect into your designs and assemblies. Modules are complete, wired, tested sub-assemblies to save you untold time, effort, expense. They provide that firm foundation on which you can build up your creative talents. And especially vital in facing today's engineering shortage.

Seven standard circuits are now available in handy module form. Others to follow for both **standard** and **special** circuit requirements. These modules are but part of the Aerovox Automation Program. New type capacitors, resistors, sockets and other components, in conjunction with advanced printed wiring and ingenious automatic assembly techniques, are available to those interested in radio-electronic Automation.



WRITE FOR BROCHURE! ***Engineering details available to anyone writing on business stationery. Let our module specialists show you how to apply these basic circuit assemblies in gaining released time for your creative efforts.***

MODULE DIVISION

AEROVOX CORPORATION
ARLINGTON, VIRGINIA

In Canada: AEROVOX CANADA LTD., Hamilton, Ont.
Export: Ad. Auriema, Inc., 89 Broad St., New York, N. Y. • Cable: Auriema, N. Y.

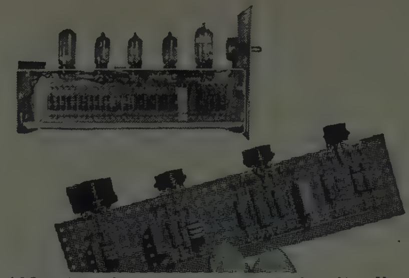
AEROVOX CORPORATION, NEW BEDFORD, MASS. • HI-Q DIVISION, OLEAN, N. Y. • ACME ELECTRONICS, INC., MONROVIA, CALIF. • CINEMA ENGINEERING CO., BURBANK, CALIF. • HENRY L. CROWLEY & CO., WEST ORANGE, N. J.

Ideas, Techniques, Designs

from the Alden Handbook of mechanical components to mount, house, fasten, connect and monitor electronic circuitry.

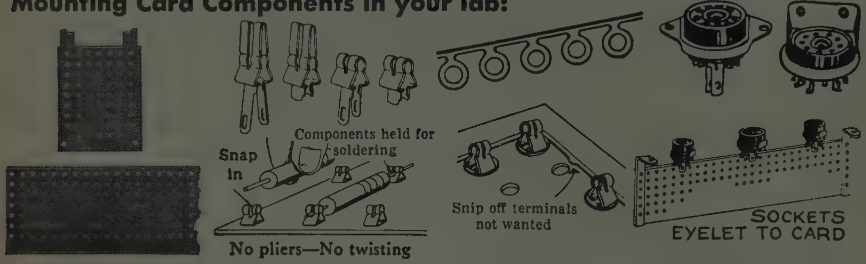
Making terminal cards your electronic chassis

Now for the first time, using standard Alden Terminal Mounting Card Components, you can mount all circuitry elements including vacuum tubes and other plug-in sockets directly on terminal cards with all their associated components . . . to have a construction that for all intents and purposes makes your terminal card the complete electronic chassis by itself.



Alden terminal card mounted circuits slip into simplified housings.

It's as simple as this — you start with these standard Alden Terminal Mounting Card Components in your lab:



❶ You take the ALDEN PRE-PUNCHED TERMINAL MOUNTING CARDS and plan your component locations on planning sheets.

❷ Choose the ALDEN MINIATURE RATCHET TERMINALS that fit your components, and stake them per pattern using lab staking tool.

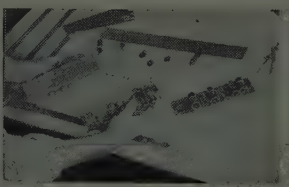
❸ Use ALDEN JUMPER STRIP staked under terminals to eliminate wiring to common circuit.

❹ Mount your tubes directly on the Terminal Cards using ALDEN CARD-MOUNTING SOCKETS.

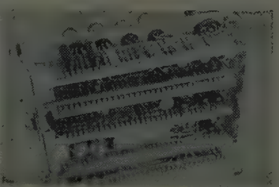
Simply and easily you end up with beautiful sub-assemblies of completed circuitry. If you wish, Alden will handle the volume staking production, delivering to you the cards with all terminals, jumpers and sockets staked into position.

By making the Terminal Card your chassis, you —

1) Eliminate point-to-point chassis wiring.



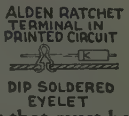
2) Make your circuitry simple unit sub-assemblies...



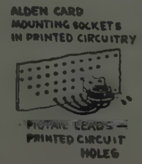
3)...that mount compactly in chassis as accessible rows of wiring.

It's a simple step to printed circuitry

Once your circuitry is organized on Alden Terminal Cards it's a simple step to go to printed wiring for your volume requirements. All components are in a single plane, components are oriented for easy insertion into printed circuit holes—this orientation is even most favorable for automated component assembly.



Even in printed circuitry, Alden Ratchet Terminals may be used as stand-off terminals for leads—isolation of heat sensitive components—or for components that must be removed without disturbing the printed circuitry solder.


ALDEN CARD MOUNTING SOCKETS IN PRINTED CIRCUITRY
PIGTAIL LEADS — PRINTED CIRCUIT HOLES

For printed circuits, Alden Card Mounting Sockets are available with pigtails on each contact. These pigtails simply insert in printed circuit holes for dip solder connection.

Simple circuitry packaging

By organizing all circuitry in single planes, packaging problems are tremendously simplified by permitting their mounting in close spaced rows in metal chassis. The metal chassis now returns to its proper function of being a protective housing, like a watch case—and your circuitry, though taking little space, is accessible for easy checking, removal or replacement—with spare circuit cards being small enough to airmail.

For those who would like standard housing for their card mounted circuitry, Alden Basic Chassis are available to group your circuitry function by function as plug-in replaceable units.

To get the whole story, write to us for the latest Alden Handbook specification sheet on the Alden Terminal Card mounting and let us know what your particular problems are so we can send specific information.

ALDEN PRODUCTS CO.
5121 N. MAIN ST., BROCKTON 64, MASS.

News-New Products

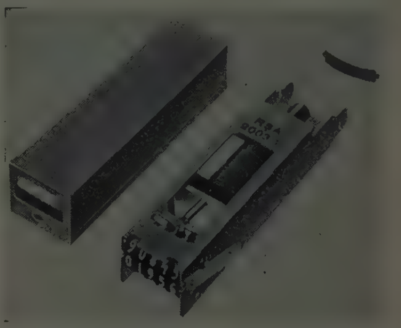
These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your I.R.E. affiliation.

(Continued from page 106A)

no load speed 4800 RPM minimum and power input at stall is 12.2 watts total. The fixed phase operates on 115 volts. Series 2287 may also be wound for 60 cps operation in which case no load speed minimum is 3200 RPM.

Electrical Counter

A five digit electrical counter designed for reliable highspeed impulse recording, is announced by **North Electric Co.,** Galion, Ohio.



The counter, known as Type E-RSA-200, is suitable for installation in small spaces, measuring $\frac{3}{4}$ by $1\frac{3}{16}$ by $4\frac{1}{16}$ inches overall. Each counter is enclosed in a metal cover, available either as an individual unit or in strips of ten, with a common cover. A flexible spring clip holds each unit in place on the mounting plate.

The mechanism of the counter is built so that the nylon wheels cannot jam or get out of mesh. The coil of the unit is terminated with soldering lugs in rear. Final inspection tests are made at a rate of 20 impulses per second.

For additional information on the Type E-RSA-200 contact North Electric.

Toroidal Coil Winding Machine Brochure

Arnold Magnetics Co., 5962 Smiley Drive, Culver City, Calif., has published a new 4-page folder which describes a portable toroidal coil winding machine used for both laboratory and production requirements. The literature explains how the machine sets up, operates, accommodates a range of wire sizes from AWG 26 to 44 and winds at speeds up to 1,500 turns per minute.

(Continued on page 110A)

FREE TO ELECTRONIC ENGINEERS & DESIGNERS

A new Superior Tube catalog gives complete facts on cathodes, anodes, grid cups—their characteristics, uses, variety

For the first time, Superior Tube Company puts all the basic data on its broad line of cathodes and other vacuum tube components into a single catalog. The new CATHALOYS are fully described. Easy-to-read tables give dimensions and tolerances on all standard cathode types, plus detailed chemical and physical properties on 23 different alloys. If you design vacuum tubes or electronic equipment using fabricated tubular parts, don't fail to send for this complete new catalog from Superior Tube Company—world's leading independent supplier of cathodes to the electronics industry.

*Manufactured under U.S. Patents. †TM Reg. U.S. Pat. Off., Superior Tube Co.
NOTE. Cathaloy is a trademark of Superior Tube Co., Reg. U.S. Pat. Off.

Superior Tube

The big name in small tubing

All analyses .010″ to ⅝″ O.D.
Certain analyses in light walls up to 2½″ O.D.

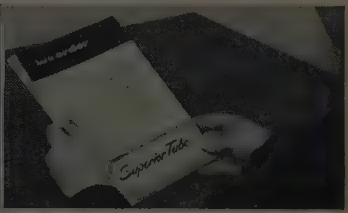
Superior Tube
electronic

HOW YOU CAN USE THIS CATALOG

WHICH ALLOY. Complete descriptions of Superior Tube alloys make it easier for you to make the right selection.

WHICH TYPE. Tabulated dimensional information given on seamless, Lockseam*, and WELDRAWN† cathodes.

ANY KIND OF TUBE. Sections cover receiving tubes, cathode ray tubes, transmitter tubes, other tubing applications.

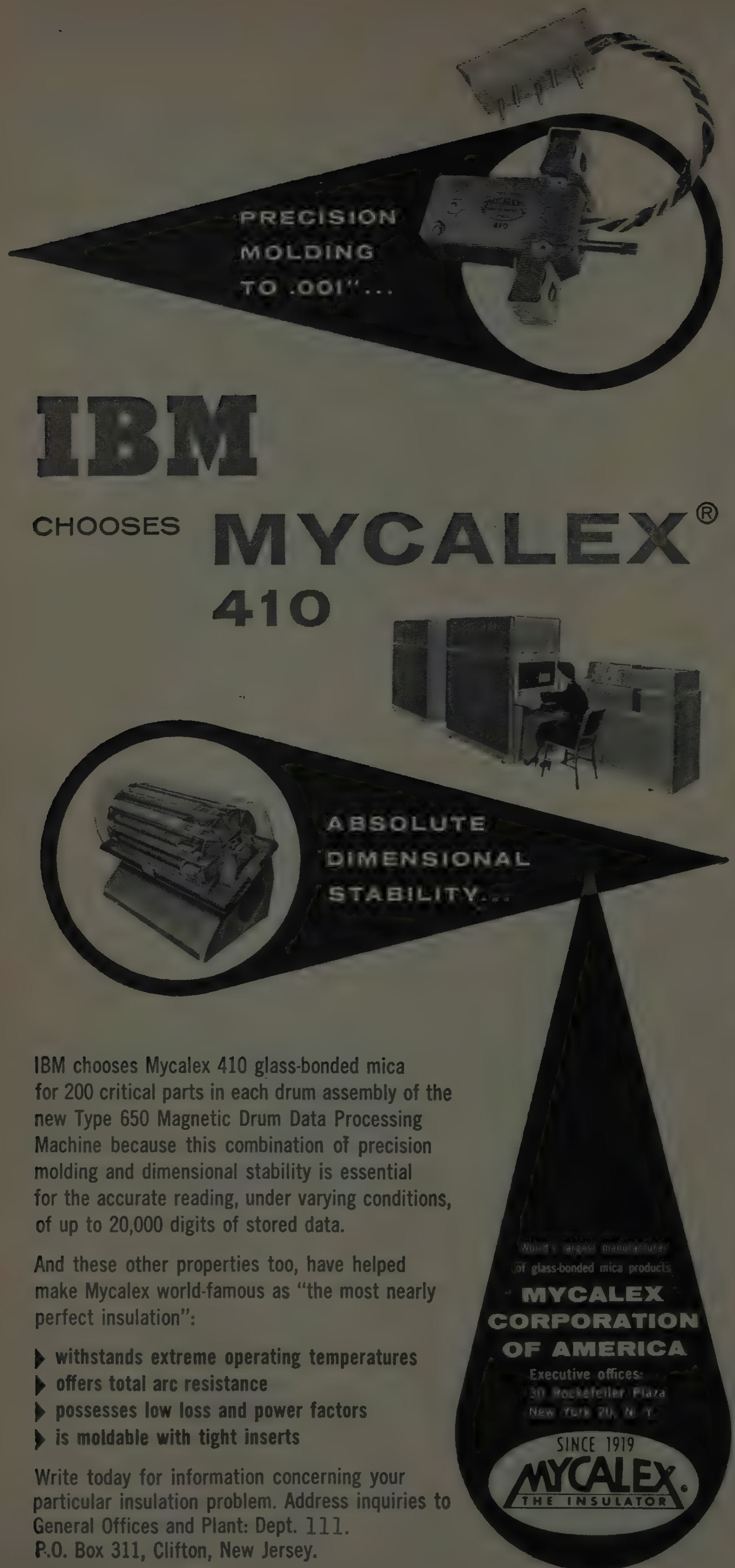


SALES POLICY: Detailed explanation simplifies ordering procedure for you, and shortens your procurement cycle.

SEND FOR YOUR COPY

Use this handy coupon or write

Superior Tube Company
2506 Germantown Ave., Norristown, Pa.
Yes, I want a copy of your new Electronics Catalog #50
Name________________ Title__________
Department________________________
Company________________________
Street________________________
City______________ Zone____ State__________



PRECISION MOLDING TO .001"...

IBM CHOOSES MYCALEX® 410

ABSOLUTE DIMENSIONAL STABILITY...

IBM chooses Mycalex 410 glass-bonded mica for 200 critical parts in each drum assembly of the new Type 650 Magnetic Drum Data Processing Machine because this combination of precision molding and dimensional stability is essential for the accurate reading, under varying conditions, of up to 20,000 digits of stored data.

And these other properties too, have helped make Mycalex world-famous as "the most nearly perfect insulation":

- withstands extreme operating temperatures
- offers total arc resistance
- possesses low loss and power factors
- is moldable with tight inserts

Write today for information concerning your particular insulation problem. Address inquiries to General Offices and Plant: Dept. 111.
P.O. Box 311, Clifton, New Jersey.

World's largest manufacturer
of glass-bonded mica products

MYCALEX
CORPORATION
OF AMERICA
Executive offices:
30 Rockefeller Plaza
New York 20, N.Y.

SINCE 1919
MYCALEX
THE INSULATOR

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 108A)

Mobile Transceiver

Developed for long-distance voice communication among vehicles and designed to withstand desert heat and rough terrain, the **West Coast Electronics Co.,** 5873 W. Jefferson Blvd., Los Angeles 16, Calif., recently introduced its Model 3 A.M. Mobile Unit, a transmitter-receiver for operation in the 148 to 174 mc frequency range.

The transmitter delivers 20 watts output and employs speech clipping to give exceptional articulation in the presence of noise.

Unusual sensitivity is provided in the receiver to permit detection of distant signals; the minimum detectable signal level is at least 31 db below one microwatt. Automatic volume control maintains the receiver output constant at rf input levels up to 50,000 μv.

The receiver delivers up to two watts of audio signal power. A noise clipper and an adjustable carrier-operated squelch circuit minimize noise output.

Transmitter and receiver are crystal controlled; the frequency stability of 0.003 per cent insures accurate setting of units operating on the same channel. Transmitter and receiver can be operated on the same frequency or different frequencies.

The unit transmits and receives amplitude modulated signals.

The unit is packaged for installation in car, jeep, or truck, and operated from a six-volt storage battery supply; it can be supplied for 12-volt operation on special order. Microphone, speaker, control panel and whip antenna are included in the basic unit.

A weatherproof cover can be supplied if required.

(Continued on page 112A)

a guy named Og

Once your name was Og. You tired of shouldering mastodon steaks...of dragging your mate by her hair. You invented the wheel.

Later, your name was Watt. Steam made your kettle-lid dance...and the Industrial Revolution was on.

Yesterday, you were a bicycle mechanic named Henry...today, your brainchild's descendants are counted in millions.

Your name is legion. You created every linkage... every device...every system.

You're an engineer.

You make things work better...faster...more accurately ...more economically.

Next week...next month...next year...some system will need a better, faster, more accurate or more economical means of recording...or indicating...or computing...or controlling a process.

You'll want precision potentiometers.

You'll discover that Helipot makes the most complete line... linear and non-linear versions...in the widest choice of sizes, mounting styles and resistances.

many models of HELIPOT* *precision potentiometers are stocked for immediate shipment ...our engineers will gladly adapt standard* HELIPOTS *to your requirements...or build entirely new* HELIPOTS *for you.*

for information and specifications ...write for data file 1103

You're an engineer. Your career is in the making. Helipot would like to hear from you.

Helipot *first in precision potentiometers*

Helipot Corporation/South Pasadena, California
Engineering representatives in principal cities
a division of BECKMAN INSTRUMENTS, INC.

BECKMAN

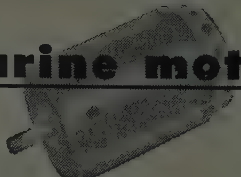
* REG. U.S. PAT. OFF.

Manufacturers of Specialty Rotating Equipment Including Motors, Fans & Blowers

air-marine motors *Inc.*

369 Bayview Avenue
Amityville, L. I., N. Y.
AMityville 4-3700

West Coast Factory
2055 Pontius Avenue
Los Angeles 25, Calif.



PRECIOUS METAL WIRES
Produced in Platinum, Gold, alloys and pure metals—small diameter . . . Platinum alloy resistance wires. . . Pure Iridium and Rhodium-Iridium alloy Thermocouple Wire.

COATED WIRES
Comprising an extensive range of electroplated grid wires . . . Enamel insulated wires for precision resistors and potentiometers.

BASE METAL WIRES
Very small diameter—for filaments, thermo-couples, resistance units.

Serving Industry—
FOR OVER 53 YEARS

Write for Latest List of Products

SIGMUND COHN CORP. 121 So. Columbus Avenue • Mount Vernon, N.Y.

News–New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 110A)

Miniature Oscilloscope

A new, highly precise cathode-ray oscilloscope, type 331, which was designed for field or laboratory testing and servicing of many types of electronic computers, has been announced by the **Technical Products Div., Allen B. Dumont Laboratories, Inc.,** 750 Bloomfield Ave., Clifton, N. J.

The new instrument, weighs 19 pounds, and offers many advantages for field or laboratory testing of television broadcasting and receiving equipment, for testing microwave equipment, and for a wide variety of other field and laboratory test purposes.

It may be used as a time-measuring device for time intervals as long as 2.5 seconds and as short as the rise time of its signal amplifier which is 0.08 μsec. It also is an ac/dc electronic voltmeter with a range of 0.4 to 400 volts, full scale, with an upper frequency limit of 4 mc (30 per cent down).

The type 331 employs a tight-tolerance cathode-ray tube, the flat-faced Type 3WP.

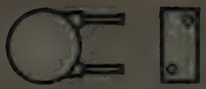
The Type 331 incorporates a calibrated sweep, an illuminated calibrated scale, a wide-band signal-delay line, a calibrating square-wave at the front panel which may also be used on external equipment, and a positive fast-rising gate output at the front panel for triggering other equipment.

Calibration accuracy in time-per-major scale-division and volts-full-scale is within 5 per cent. A 3-times expansion of any calibrated sweep can be switched in. Any part

(Continued on page 114A)

ceramic capacitors designed for mechanized assembly

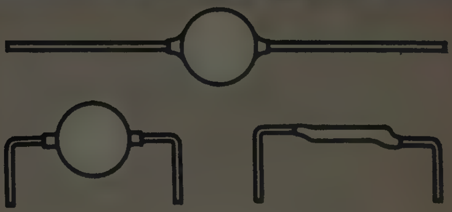
NOW



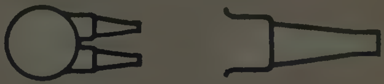
Pin Terminal Disc Ceramic Capacitors
The short, stiff terminals, 3/16" long, are accurately held to predetermined lead spacings. Closely controlled coating "pants" on the leads prevent resin from extending beyond the tangent line of the disc, yet no bare disc is exposed between leads. Available in bulk or in Tube-Paks.

Just as Sprague pioneered in the automatic *manufacture* of capacitors, it now takes the lead in supplying these capacitors for automatic *insertion.* New ceramic capacitor configuration—with double-tinned leads and terminals spaced precisely to a tolerance of ± .005"—assures foolproof automatic insertion in printed wiring boards. New packaging means top efficiency in handling, testing, and feeding the capacitors. And whichever styles you choose, you benefit from the advanced manufacturing techniques . . . exhaustive quality control procedures . . . and priceless on-the-spot engineering counsel which have built Sprague's reputation.

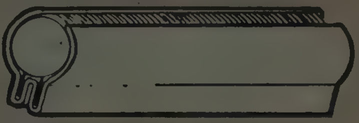
Brief descriptions of the designs and packages are shown at right. Complete information is available on letterhead request to the Technical Literature section, Sprague Electric Company, 235 Marshall St., North Adams, Massachusetts.



Diametral Lead Disc Ceramic Capacitors
After tape loading in magazines by the manufacturer, these capacitors need only have their leads precut before automatic insertion.



Taper-Tab Terminal Disc Ceramic Capacitors
Flat terminals are designed to jam easily into chassis slots, holding capacitors firmly during subsequent assembly steps prior to dip soldering. Available in bulk or in Tube-Paks.



Tube-Pak★ Packaging
Up to 200 disc capacitors, pin terminal or taper-tab terminal, can be packed in each two foot long Tube-Pak. These slotted cylindrical magazines are a perfect fit for automatic insertion equipment now in use by several leading television manufacturers. Both types are plugged at each end before shipment.

★Trademark

for automation

WORLD'S LARGEST CAPACITOR MANUFACTURER

SPRAGUE®

"Repeat Performance"

In the production of automatic systems for aircraft, missiles or other uses where high standards must be maintained a prime requisite is the *consistent* reliability of components.

If the accepted performance of relays for such applications is to be repeated exactly, lot after lot, the production must be controlled unit by unit through tests *more critical* than those usually applied in quality control. The slightest deviation from normal must be recorded and the information obtained used to guide the control of subsequent manufacture.

The production of North High Reliability Relays is controlled by constant repetition of the following rigorous tests.

A. ***Thermal Cycle Test;*** measuring operate and release values at specified voltages or currents within temperature variations from —65°C to +125°C.

B. ***Vibration on Most Vulnerable Axis Test;*** over 50,000 oscillations of 0.2 inches amplitude in 30 minutes.

C. ***Run-in Test;*** one thousand monitored operate-release cycles.

D. ***Service Test;*** including Sealing, Insulation Resistance, Dielectric Strength and Contact Resistance.

Test values are recorded and retained for each relay to provide essential information in a never-relaxing effort aimed at

insuring reliability in . . .

NORTH RELAYS

NORTH ELECTRIC COMPANY
551 South Market Street, Galion, Ohio

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 112A)

of the expanded presentation can be positioned on the screen for viewing and measurement. An X amplifier is available for use when such signals as wobbulator sweep or 60-cps sinewaves are to be plotted on the X axis.

Read and Record Head

The latest member of a series of Read and Record Heads, Model MH 10-A, was specifically designed for low cost recording or reading on magnetic drums in memory systems of digital computers, by **Librascope, Inc.,** 808 Western Ave., Glendale, Calif.

The unit has many physical advantages. It is potted—dimensionally stable, without shrink or swell. Accurate alignment of the gap is assured by precise machining of the mounting, so that the gap is square to the mounting surface and parallel to the drum axis.

The mounting lends itself to the general purpose type drum where many heads are stacked, on drums having as few as 30 channels, or as many as several hundred.

The writing or record current of the Model MH 10-A is low; less than 20 milliamperes, while the readback voltage obtained is greater than 0.5 volts peak to peak across 500 turns.

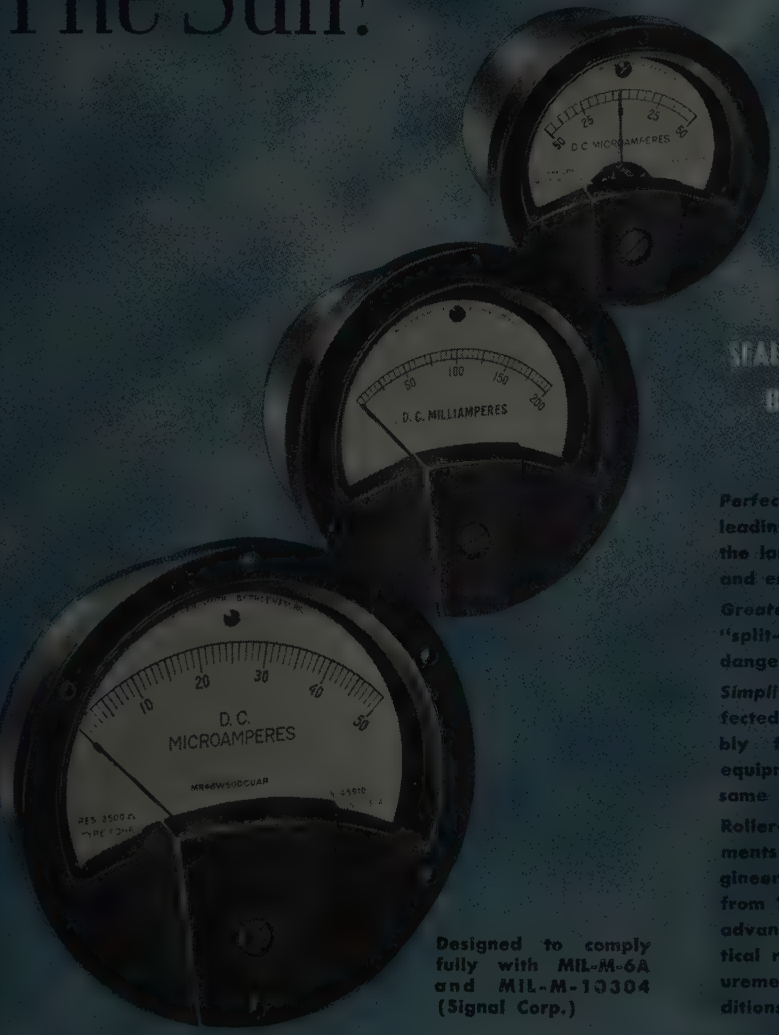
General characteristics: Cord width, 0.040 inches; number of turns, 250 turns each side of center tap; gap width, 0.001 inches; resonant frequency, over 500 kc.

With standard head mounting the MH 10-A has a radial adjustment of 0.030 inches.

The unit is completely encapsulated in a die-cast aluminum case for moisture resistance, and has a 2-piece sintered core.

(Continued on page 116A)

Something New Under The Sun!



SEALED—RUGGEDIZED INSTRUMENTS BY ROLLER-SMITH HAVE THAT "NEW LOOK" FOR

Perfect Readability: **New shrouds designed by leading industrial designers focus attention to the large dial, assuring "one look" readability and enhanced appearance.**

Greater Accuracy: **New zero adjuster permits "split-second" adjustment from the front. No danger of leaks.**

Simplified Maintenance: **New gasket seal perfected by Roller-Smith permits easy disassembly for service—NO expensive soldering equipment—NO wasted glass—you use the same glass over and over. Costs are reduced.**

Roller-Smith sealed and ruggedized instruments feature these three outstanding engineering and design improvements in all sizes from 1½ to 4½ inches to make them the most advanced on the market. Available in all practical ranges of AC and DC for accurate measurements under extreme environmental conditions.

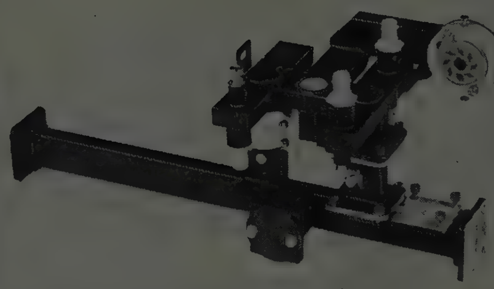
Consult our engineering staff with over 50 years experience to solve your specific research and development problems.

Designed to comply fully with MIL-M-6A and MIL-M-10304 (Signal Corp.)

An extra feature—new "wrap around" shroud with gasket seal makes these meters as modern in appearance as they are in performance. Precisely built, their neat functional form expresses the forward thinking of our engineers.

ROLLER-SMITH
Instrument Division
CORPORATION
1825 WEST MARKET STREET BETHLEHEM, PENNSYLVANIA
Precision Products Since 1898

NRK



Microwave Assemblies, Radar Components, and Precision Instruments . . . manufactured and designed to your specifications.

N.R.K. MFG. & ENGINEERING CO.
4601 WEST ADDISON STREET • CHICAGO 41, ILL. • SPring 7-2970
West Coast Representatives **TUBERGEN ASSOCIATES** 2232 W. 11th St., Los Angeles 6, Calif.

designed for the user

by Shasta division
BECKMAN

MODEL 854A WIDE BAND AMPLIFIER

features:

- ★ 10 x or 100 x voltage gain
- ★ ± ½ db response 10 cps to 1 mc @ 100 x gain, or 5 cps to 1 mc @ 10 x gain
- ★ Less than 1% distortion
- ★ 1 meg, 15 mmf input impedance
- ★ Equivalent input noise, 20 μ v @ 100 x gain, or 80 μ v @ 10 x gain
- ★ Exclusive SHASTA chassis construction

brief specifications:

Input voltage req: 100 mv rms max @ 100 x gain
1 v rms max @ 10 x gain
Output: 10 v max into min. of 3000 ohms, resistive
Power requirements: 105/130 v., 50/60 cps, 67 watts
Dimensions: 9¼" H x 7¼" W x 8¾" D
Price (f.o.b. factory): $135.00

Write today for Technical Bulletin 854A; please address Dept. SA-11.

Other Shasta Quality Instruments
Expanded Scale Frequency Meters and Voltmeters • Log Scale Voltmeters • Audio Oscillators Square Wave Generators • Power Supplies • Wide Band Amplifiers Bridges • WWV Receivers • Decade Inductors.

S-11

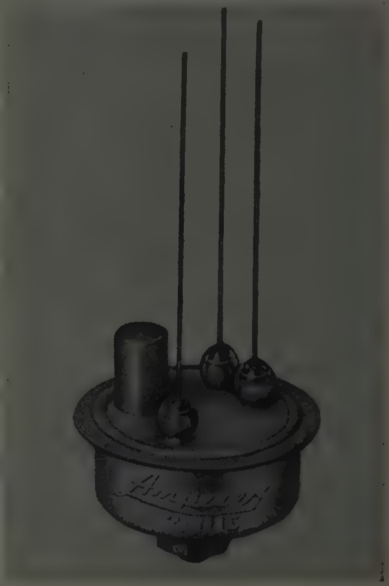
Shasta division
BECKMAN INSTRUMENTS INC.
P.O. BOX 296, STATION A • RICHMOND, CALIFORNIA
TELEPHONE LANDSCAPE 6-7730

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 114A)

5-Watt Power Transistor

Amperex Electronic Corp., 230 Duffy Ave., Hicksville, L. I., N. Y., has come out with the Type 2N115, P-N-P, Junction Power Transistor, that delivers 5 watts push-pull output with a 6 volt supply.



The Type 2N115 has a high current rating at a low drop across the transistor itself, the relationship between the base current and collector current is extremely linear, and the gain is high for the power level. The transistor is internally insulated from its metal case, so that no external mica insulation is needed when mounting the unit on a chassis. The output impedance is low enough for a 5 ohm speaker voice coil to be used directly as the collector load in the audio output stage, so that output transformers are not needed.

The 2N115 is suitable for use in the output stage of automobile radios, either single-ended or push-pull. In push-pull the gain would be 27 db. The 2N115 can also be used as an oscillator, running from a 6- or 12-volt supply, like a TV flyback circuit, to deliver high voltages to vacuum-tube amplifiers. In such cases, it can replace vibrators in automobile radios. Other applications include use as a servo amplifier, a clocking pulse

(Continued on page 118A)

FOR YOUR AUTOMATION PROGRAM

VARIABLE RESISTORS FOR PRINTED CIRCUITS

Type UPM-45
For TV preset control applications. Control mounts directly on printed circuit panel with no shaft extension through panel. Recessed screwdriver slot in front of control and 3/8″ knurled shaft extension out back of control for finger adjustment. Terminals extend perpendicularly 7/32″ from control's mounting surface.

Type GC-U45
Threaded bushing mounting. Terminals extend perpendicularly 7/32″ from control's mounting surface. Available with or without associated switches.

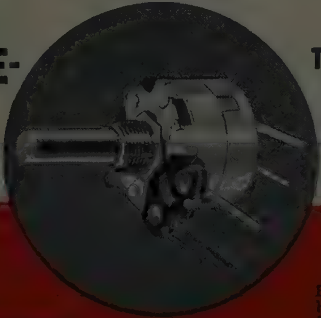
Type U70 (Miniaturized)
Threaded bushing mounting. Terminals extend perpendicularly 5/32″ from control's mounting surface.

Type YGC-B45
Self-supporting snap-in bracket mounted control. Shaft center spaced 29/32″ above printed circuit panel. Terminals extend 1-1/32″ from control center.

Type XP-45
For TV preset control applications. Control mounts on chassis or supporting bracket by twisting two ears. Available in numerous shaft lengths and types.

Type XGC-45
For applications using a mounting chassis to support printed circuit panel. Threaded bushing mounting.

VARIABLE RESISTORS FOR SOLDERLESS "WIRE-WRAP" CONNECTIONS



Type WGC-45
Designed for solderless wire-wrapped connections with the use of present wire-wrapping tools. Available with or without switch and in single or dual construction.

[illegible]

CTS

CHICAGO TELEPHONE SUPPLY
Corporation
ELKHART • INDIANA
FOUNDED 1896

EAST COAST OFFICE
Henry E. Sanders
130 North Broadway
Camden 2, New Jersey
Phone: Woodlawn 6-1668
TWX No. Camden NJ 380
Phila. Phone: Market 7-3129

WEST COAST OFFICE
Robert A. Stackhouse
928 S. Robertson Blvd.,
Los Angeles 35, Calif.
Phone: Crestview 4-5931
TWX No. BEV H 7666

SOUTHWESTERN U.S.A.
John A. Green Company
6815 Oriole Drive
P.O. Box 7224
Dallas 9, Texas
Phone: Dixon 9918

CANADIAN DIVISION
C. C. Meredith & Co., Ltd.
Streetsville, Ontario
Phone: 310

SOUTH AMERICA
Jose Luis Pontet
Buenos Aires, Argentina
Montevideo, Uruguay
Rio de Janeiro, Brazil
Sao Paulo, Brazil

OTHER EXPORT
Sylvan Ginsbury
8 West 40th Street
New York 18, New York
Phone: Pennsylvania 6-8

The Exclusive Specialists in Precision Mass Production of Variable Resistors

world's largest Ion Trap maker
offers lowest priced Ion Trap
on the market

NEW SIMPLIFIED CONSTRUCTION

MODEL T-312. The new simplified steel construction lowers manufacturing costs by fully utilizing, for the first time, the Alnico permanent magnet's maximum efficiency. This makes Model T-312 the lowest priced ion trap on the market. Installs in only 2-3 seconds—just slip on.

FEATURES OF BOTH MODELS

STAYS PUT—No wobble; no shift during shipment; no realignment necessary when your TV set is installed in the home.

EASILY ADJUSTED—Slides more uniformly over tube's neck due to metal-to-glass contact.

STABILIZED AND TESTED on special equipment designed and used only by Heppner, each individual Heppner Ion Trap is guaranteed to meet your working requirements.

UNUSUALLY FAST DELIVERY.

LIGHTWEIGHT—Snap-On Model weighs only ½ ounce; Slip-On Model only 3/5 ounce. Will not harm tube's neck.

ALNICO P.M. USED—Retains magnetism indefinitely.

SNAP-ON ION TRAP

installs instantly—just snap on—stays put

MODEL E-437. Saves you expensive production manhours with EXCLUSIVE instant snap-on feature. Reduces your parts costs because priced below competition. Clamp-type construction of Hardened Spring Steel.

Heppner has built over 25,000,000 ion traps to date

Write today for further information on better ion traps at lower prices.

HEPPNER
MANUFACTURING COMPANY
Round Lake, Illinois (50 Miles Northwest of Chicago)
Phone: 6-2161
SPECIALISTS IN ELECTRO-MAGNETIC DEVICES

Representatives:
William I. Duncan, Jr.
3451 N. 10th St., Philadelphia 40, Penna.
Ralph Haffey
R.R. 1, U. S. 27, Coldwater Rd., Ft. Wayne 8, Indiana
Irv. M. Cochrane Co.
408 S. Alvarado St., Los Angeles, Calif.
John J. Kopple
60 E. 42nd St., New York 17, N.Y.
Ben H. [illegible]
144 Collingsworth Drive, Rochester 10, N.Y.

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 116A)

amplifier in computers, and a power switch (at 24 volts, 2 amperes, for example).

Microwave Shielded Enclosures

A new series of enclosures for microwave and radio frequency interference applications was announced today by the **Ace Engineering & Machine Co., Inc.,** 3644 North Lawrence St., Philadelphia 40, Pa.

The new "Microshield" enclosures utilize the same basic design and construction principles of shielded enclosures now in use. Additionl microwave absorption characteristics are achieved in the new series by incorporating two new specially designed materials into the basic structure. Lightweight McMillan Hair-Mat Type 8 is used on walls, doors, and ceiling. Floor absorption is provided by McMillan Plastic Foam Block Type B which can be walked on without any loss of electrical characteristics.

Use of these new materials does not in any way affect the rf shielding characteristics of the basic structure. Whether the Microshield enclosure is made of sheet copper or galvanized steel (RFI), or of copper or galvanized screening materials (cell-type or single-shield), rf attenuation is equal to that achieved without Microshield features.

Major application of the new rooms is expected to be simulation of free space for microwave testing in the electronic, aviation, and allied industries. Complete technical information is available on request to Ace.

(Continued on page 121A)

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 118A)

Robertshaw-Fulton Elects Reynolds

At a meeting of the board of directors of **Robertshaw-Fulton Controls Co.,** R. S. Reynolds, Jr., was elected chairman of the board of the company. He succeeds his father R. S. Reynolds, Sr. who died on July 29.

Reynolds has been associated with the company since its formation, serving as a director and financial vice president.

At the same meeting, the board of directors named J. Louis Reynolds and John A. Robertshaw, Jr. directors to fill vacancies on the board. Mr. J. Louis Reynolds is a vice president of Reynolds Metals Company, and Mr. Robertshaw is assistant vice president of Robertshaw-Fulton, in charge of foreign operations.

Subfractional Motor

Holtzer-Cabot Motor Div., National Pneumatic Co., Inc., 125 Amory St., Boston, Mass., announces the introduction of a new subfractional motor in a 3-inch diameter frame.

The majority of the new motors will be of the single-value capacitor type, suitable for single-phase operation. The efficiencies of the various ratings run over 30 per cent. As a result, there is a lower temperature rise and less heat to be dissipated where the driven motor is enclosed.

The motors have stainless steel shafts and a new rotor construction. The class is basically of the reluctance type, but the rotor is

(Continued on page 122A)

PRECISION

The Only COMPLETE COIL FORM SERVICE *Available . . .*

- SQUARE TUBES
- ROUND TUBES
- RESINITE COIL FORMS
- BOBBINS
- MANDRIL SERVICE
- FABRICATING SERVICE

SQUARE AND RECTANGULAR TUBES

Produced in any length, shape or size from $\frac{1}{16}''$ to 8″, wall thickness from .010 to .125. Fabricated from dielectric kraft, fish paper, quinterra or combinations, including mylar. Bowed sidewall or Di-Formed construction.

ROUND TUBES

Produced in any decimal size up to 8″ I. D. Fabricated from kraft, fish paper, cellulose acetate, mylar, polystyrene, quinterra, fibre glass and other dielectric materials.

RESINITE COIL FORMS

These coil forms have the highest resistivity of any resinated product. Furnished plain, embossed, internally threaded or triangular shape . . . also flyback transformer forms.

BOBBINS

Supplied round, square or rectangular. Cores fabricated from any of the above materials. Metal, asbestos, plastic or fibre flanges. Constructed to fit smaller spaces and permit multiple winding.

MANDRIL SERVICE

Accurately ground steel and aluminum coil mandrils at cost economy comparable to commonly used undependable wood or undersized steel mandrils.

FABRICATING SERVICE

We have modern high speed equipment to provide you with any special shape or form . . . rolled, spun, flared, punched or formed to your particular requirement.

Ask about Precision's complete coil form service. Request informative bulletin.

PRECISION

PRECISION PAPER TUBE COMPANY
2051 West Charleston Street, Chicago 47, Illinois
Plant No. 2: 79 Chapel Street, Hartford, Conn.
Representatives throughout United States and Canada

Designed for

M

Application

10035
10039

Nos. 10035 and 10039
Multi-Scale Dials

A pair of truly "Designed for Application" controls. Large panel style dial has 12 to 1 ratio; size, 8½" x 6½". Small No. 10039 has 8 to 1 ratio; size, 4" x 3¼". Both are of compact mechanical design, easy to mount and have totally self-contained mechanism, thus eliminating back of panel interference. Provision for mounting and marking auxiliary controls, such as switches, potentiometers, etc., provided on the No. 10035. Standard finish, either size, flat black art metal.

JAMES MILLEN
MFG. CO., INC.

MAIN OFFICE AND FACTORY
MALDEN
MASSACHUSETTS

M

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your I.R.E. affiliation.

(Continued from page 121A)

completely cylindrical with no irregularities or slot openings.

The stator has slotted construction with distributed windings. Mylar insulation is used in the stator slots. End caps are of die-cast aluminum. Either ball or sleeve bearings are available. The standard mechanical construction provides face mounting by means of the motor's own frame screws.

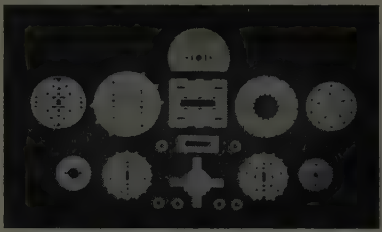
Continuous Duty Ratings Are:

Frame	Synchronous		Induction	
	1800 RPM	3600 RPM	1700 RPM	3400 RPM
3007	1/200	1/150	1/100	1/60
3012	1/150	1/100	1/75	1/50
3018	1/100	1/60	1/50	

For bulletins containing complete data, write to the company.

Electron Tube Insulators

American Lava Corp., Cherokee Blvd & Mfgrs. Rd., Chattanooga 5, Tennessee, is producing AlSiMag 393, custom made ceramics as thin as a 0.009 inch which are overcoming the limitations of some of the currently used insulating materials in certain electron tube applications.

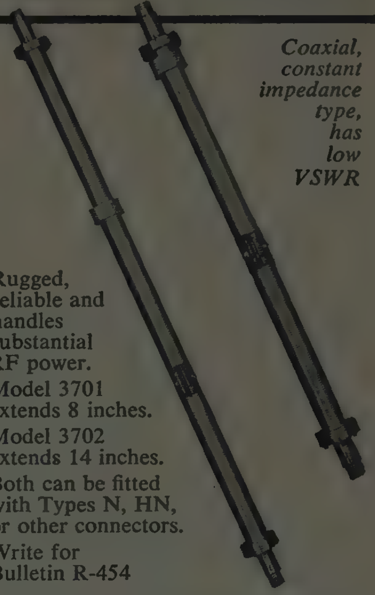


Principal advantages of these ultra-thin ceramics are: Ability to de-gas at higher temperatures, Extension of operating temperature range for the finished tube, Reduction of damage caused by fatigue failure of parts, Elimination of emission loss resulting from high temperatures, shock and vibration, and superior resistance to heat deterioration.

Production runs of these small, intricate parts are being produced at an accelerated pace. Up-to-date engineering suggestions and current samples are available on request to: Contact J. L. Rifkin, Steatite Div.

(Continued on page 124A)

52-ohm
LINE STRETCHERS



Coaxial, constant impedance type, has low VSWR

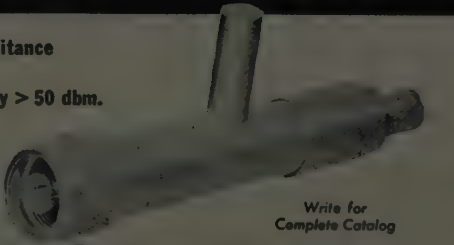
Rugged, reliable and handles substantial RF power.
Model 3701 extends 8 inches.
Model 3702 extends 14 inches.
Both can be fitted with Types N, HN, or other connectors.
Write for Bulletin R-454

ANTENNA SYSTEMS—COMPONENTS
AIR NAVIGATION AIDS—INSTRUMENTS

AMCI ALFORD
Manufacturing Co. Inc.
299 ATLANTIC AVE., BOSTON, MASS.

COAXIAL CRYSTAL MOUNTS

- Video output capacitance
- Fixed tuned
- Tangential sensitivity > 50 dbm.
- 50 — 8000 Mc.
- D. C. Return
- Matching Network



Write for Complete Catalog

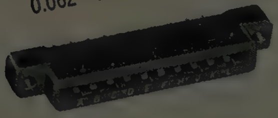
μ LAB MICROLAB
OKNER PARKWAY, LIVINGSTON, NEW JERSEY

Here are your
CANNON CONNECTORS

for PRINTED CIRCUITS

Available in 5 Sizes

1. **DX-1052.** Length 2-13/32". 10 contacts, spaced 5/32". For cards 0.057" to 0.067" thick.
2. **DX-1852.** Length 3-21/32". 18 contacts, spaced 5/32". For boards 0.060" to 0.071" thick.
3. **DX-2252.** Length 4-9/32". 22 contacts, spaced 5/32". For boards 0.060" to 0.071" thick.
4. **DX-2842.** Length 4-9/32". 28 contacts, spaced 1/8". For boards 0.060" to 0.071" thick.
5. **DY-4453.** Length 4-9/32". Double row, total of 44 contacts, spaced 5/32". For printed circuit boards 0.062" to 0.100" thick.



*Nylon plastic shells . . .
gold plated contacts*

DX contacts of phosphor bronze; DY of beryllium copper. All contacts "grip" the board, which enters to a depth of approximately 11/32". Each rated at 5-amp. Polarization studs provided. Flashovers 2000 and 2500 v. 60 cps ac rms.

Single-row types for boards printed on one side only, or both sides common. Double-row type for boards printed both sides having different circuits, not common.

Please refer to Dept. 377

CANNON PLUGS

40th YEAR 1915 1955

CANNON ELECTRIC CO., 3209 Humboldt St., Los Angeles 31, California. Representatives and distributors in all principal cities

---

INSTRUMENTS
INDUSTRY NEEDS

Hycon engineering skill and design keep pace with ever-changing industry, producing instruments that anticipate need—designed to simplify and speed production. Depend on Hycon for electronic testing equipment.

MODEL 625 DIGITAL RATIOMETER

Measures ratio of two DC voltages where one is derived from the other. Ratio is displayed on a three digit servo-positioned counter. Provides a discreet indication of one part in a thousand. Slewing time is less than 4½ seconds full scale. The response is critically damped. $550⁰⁰

MODEL 615 DIGITAL VTVM

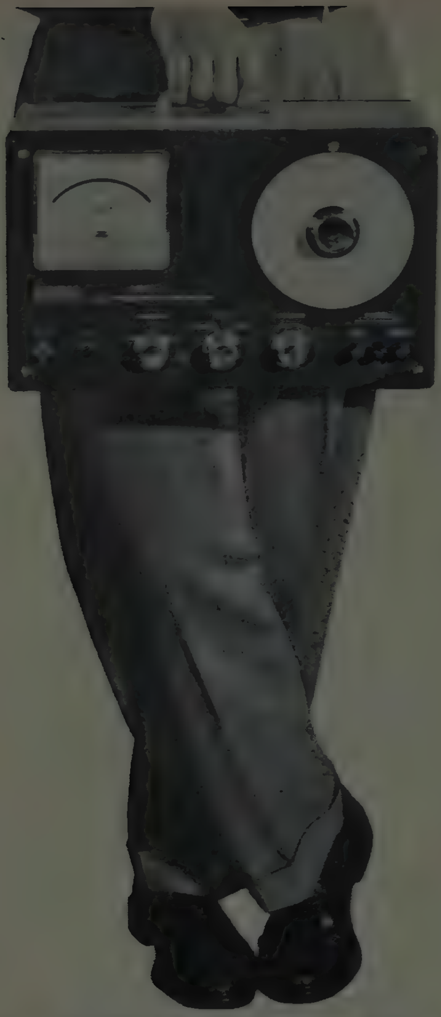
Ideal for production-line testing and the laboratory, this new VTVM gives direct readings, without interpolation. Features illuminated digital scale with decimal point and polarity sign . . . 12 ranges (AC, DC, ohms) . . . response with auxiliary probe to 250 mc . . . accuracy: 1% on DC and ohms; 2% on AC. FIELD RUGGEDNESS . . . LAB PRECISION $374⁵⁰

MODEL 617 3" OSCILLOSCOPE

Designed both for color TV servicing and laboratory requirements. Features high deflection sensitivity. (.01 v/in rms); 4.5 mc vertical bandpass, flat within ±1 db; internal 5% calibrating voltage. Small, lightweight . . . but accurate enough for the most exacting work. SPECIAL FLAT FACE 3" CRT PROVIDES UNDISTORTED TRACE EDGE TO EDGE $269⁵⁰

Write for catalog sheets and detailed specifications of any of the instruments shown above—or for complete list of Hycon field testing equipment.

Hycon
ELECTRONICS, INC.
321 SOUTH ARROYO PARKWAY
PASADENA, CALIFORNIA
A SUBSIDIARY OF HYCON MFG. COMPANY



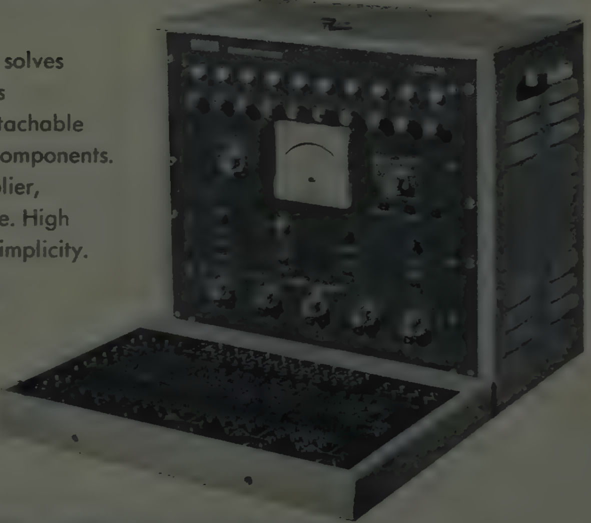
True sine and square waves for servo, geophysical, and computer work. 0.01 to 1000 cps in 5 decades. High stability, low distortion. Accurate frequency calibration and precisely metered output.

DONNER MODEL 15
LOW FREQUENCY GENERATOR
$365, F.O.B. Berkeley

ADVANCED
INSTRUMENTATION

Versatile engineering tool solves both differential equations and transfer functions. Detachable problem boards, plug-in components. Function generator, multiplier, other accessories available. High accuracy with operating simplicity.

DONNER MODEL 30
ANALOG COMPUTER
$995, F.O.B. Berkeley



DONNER SCIENTIFIC COMPANY

2801 Seventh St.
Berkeley 10, Calif.

Complete Data on Request

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 122A)

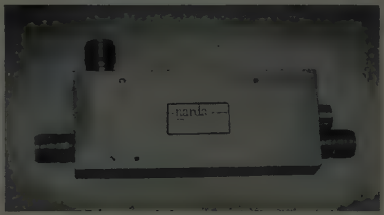
Byron Jackson Merges With Borg-Warner

Byron Jackson Co. stockholders approved a reorganization plan calling for the merger of that company with **Borg-Warner Corp.** at a special meeting held at Byron Jackson's headquarters offices in Vernon. The merger plan provides that Borg-Warner will exchange four shares of its common stock for each five shares of Byron Jackson.

The vote, as announced by E. S. Dulin, president of Byron Jackson, showed 3,124 stockholders representing nearly 85 per cent of the outstanding stock in favor of the merger. Only 59 stockholders, representing less than 1 per cent of the shares outstanding, voted against the merger. Dulin further pointed out that more than 82 per cent of all stockholders voted.

Directional Couplers

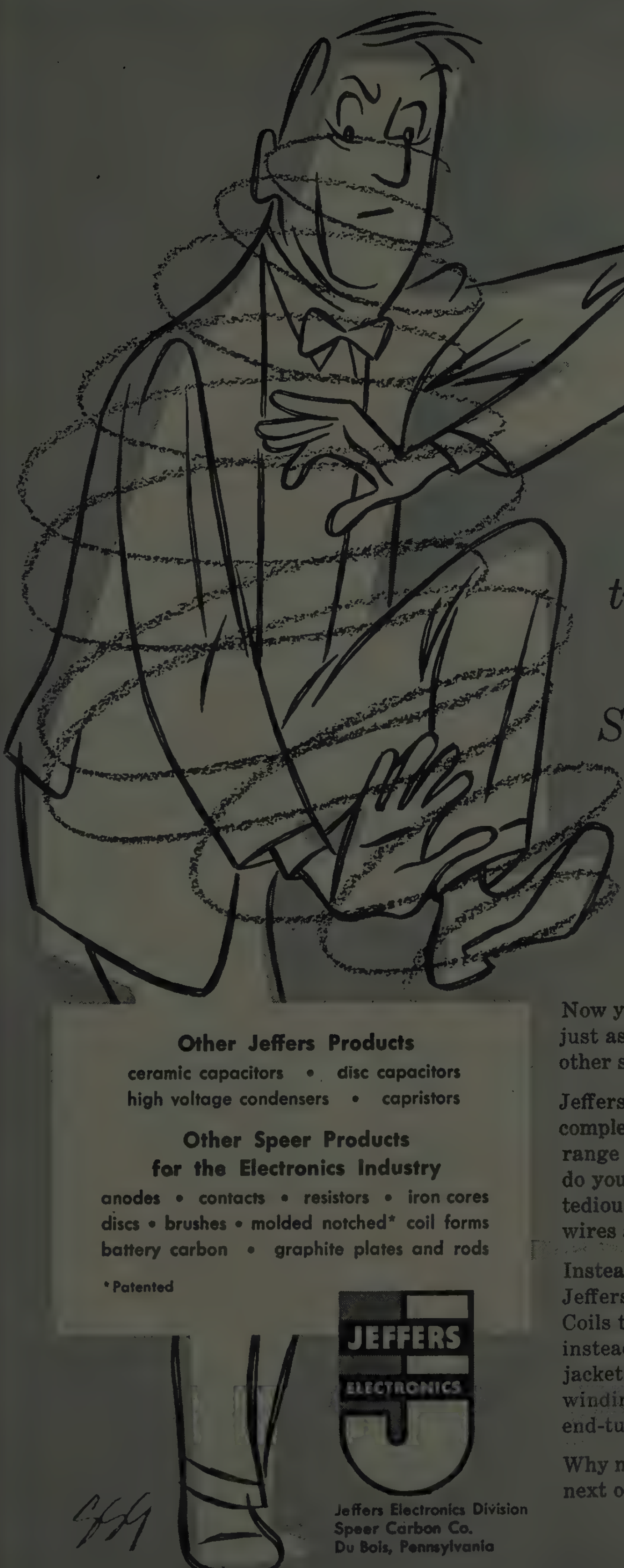
Four new models of wide band coaxial directional couplers for microwave power monitoring and measurement, or as fixed attenuators, have been added to the line of **The Narda Corp.,** Mineola, L. I., N. Y.



The four couplers cover the range of 225 to 4,000 mc, each covering a full octave frequency range and available in 20 or 30 db coupling values. The frequency range is so divided that each coupler covers the complete range of the most widely used bands, that is: 225–460, 460–950, 950–2,000, and 2,000–4,000 mc. The coupling variation over the frequency range of each coupler is less than 1 db while the directivity is higher than 20 db over the full band. The vswr of the primary arm is less than 1.15 in all models.

The couplers are provided with Type N female connectors on both

(Continued on page 126A)



All wound up

trying to make your own R. F. Choke Coils?

Standardize on **Jeffers R.F. Choke Coils-**

save time, labor and expense

Now you can stock a wide range of R. F. choke coils just as you do resistors, capacitors and other similar components.

Jeffers Electronics is ready to deliver to you a complete line of R. F. choke coils with the widest range of inductance values available. No longer do you have to waste time, labor and money on slow, tedious hand assembly from miscellaneous forms, wires and coatings.

Instead you receive a standardized product from Jeffers, completely assembled and ready for use. Coils that are well made, too. Insulated copper wire instead of bare wire for windings . . . husky, molded jackets instead of those fastened by glue. All windings are soldered to leads . . . shorted end-turns completely eliminated.

Why not give Jeffers R. F. choke coils a try on your next order? *Write today for our specification sheets.*

Other Jeffers Products

ceramic capacitors • disc capacitors
high voltage condensers • capristors

Other Speer Products for the Electronics Industry

anodes • contacts • resistors • iron cores
discs • brushes • molded notched* coil forms
battery carbon • graphite plates and rods

* Patented

JEFFERS
ELECTRONICS

Jeffers Electronics Division
Speer Carbon Co.
Du Bois, Pennsylvania

Other Divisions: Speer Resistor, International Graphite & Electrode

WESGO... for the best vacuum tube ceramic

WESGO AL-300

a very high alumina ceramic

Non-gassing at elevated temperatures • Extremely high strength • Very low loss at all frequencies • Vacuum tight • Very high bond strength to a "moly-manganese" metallized coating • Can be supplied in most shapes to precise dimensional tolerances.

Write for additional information

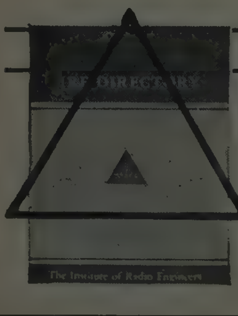
WESTERN GOLD & PLATINUM COMPANY
589 BRYANT • SAN FRANCISCO 7, CALIF.

The Telephone Book of Radio* Plants

Indicating the pace of modern radio, the 1955 IRE DIRECTORY will list phone numbers of 3000 manufacturers.

*Radio manufacturing today is generic—covering military, industrial electronics, audio, TV, automation, instrumentation—all fields using the electronic tube and transistor. Radio Engineers are the 35,000 designers and buyers reached by this IRE PURCHASING DIRECTORY. Get the facts. June 30 closing.

Engineers are educated to specify and buy!



INSTITUTE OF RADIO ENGINEERS
THE IRE DIRECTORY
Advertising Department
1475 Broadway, New York 36, N. Y.

News–New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 124A)

ends of the primary line and the output end of the secondary line. The other end of the secondary line has a built-in coaxial termination. The coaxial transmission line is machined in a solid metal block fitted with the center conductors and connectors.

Oscilloscope With 40 Input Channels

A new large screen multichannel display oscilloscope features 40 input channels according to an announcement by **Electromec. Inc., Oscilloscope Dept.,** 5121 San Fernando Rd., Los Angeles 39, Calif.

This oscilloscope provides a vertical line graph 9 inches high by 12 inches wide on a 17 inch cylindrical face cathode-ray tube. Each vertical line terminates in a dot to permit rapid and accurate readability. The output of each of the 40 amplifiers is scanned each $\frac{1}{4}$ second. The vertical length of each line indicates the peak value of the maximum ac input voltage which existed during the previous $\frac{1}{4}$ second. A calibrated graticule is provided in front of the tube for reading of voltage values and channel identification.

The frequency response of each channel is within 2 per cent from 10 cps to 10 kc and down no more than 3 db at 50 kc. Each channel input is high impedance, single ended with one side grounded. The maximum sensitivity for each channel is 45 mv peak for full 9 inch vertical deflection. An X1, x/2, x/4 attenuator and a "remote" switch is provided for each channel.

Sweep linearity is approximately 2 per cent with a system linearity of 1 per cent Jitter and cross-talk are negligible. Channel switching is accomplished by a long life

(Continued on page 128A)

CHOOSE YOUR 2Ø SERVO

These high performance 400 cycle servos conform dimensionally with Bu Ord specs in many models. Greater efficiency, minimum air gaps and extremely high torque-to-inertia ratio is attained by precision manufacturing. 60 cycle units can be made available.

Type Number	Size	Length	Mounting	Minimum Stall Torque In Oz.	No Load Speed Minimum	Power Input at Stall Total Watts	Rated Voltage Fixed Phase	Rated Voltage Control Phase	Special Features
[illegible]	10	[illegible]	Flange	[illegible]	[illegible]	[illegible]	28	28	
2409	10	$1\frac{3}{16}$"	Flange	.13	9,000	2.3	18	18	Hi Temp application
[illegible]	10	[illegible]	Synchro	[illegible]	[illegible]	4.5	52	52	
2162	10	31/32"	Synchro	.24	4,800	5.5	26	26	
[illegible]	10	[illegible]	Synchro	[illegible]	[illegible]	5.2	26	52	
2442	10	1.156"	Synchro	.13	10,000	3.2	18	18	
[illegible]	10	[illegible]	Synchro	[illegible]	10,000	[illegible]	[illegible]	[illegible]	1400 OHM cont. ph. Z
3040	10	.975"	Synchro	.149	10,000	2.6	18	54	1400 OHM cont. ph. Z
[illegible]	10	[illegible]	Synchro	[illegible]	10,000	2.8	18	18	
3185	10	.968"	Synchro	.3	6,000	6.2	26	26	avail. up to 125°C
[illegible]	[illegible]	[illegible]	Synchro	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2307	1" OD	1.5"	Synchro	.25	10,000	10.	115	115	
[illegible]	1" OD	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	115	115	
3199	11	1.703"	Synchro	.63	6,200	7.	115	115	Mark 14 Mod O
[illegible]	15	[illegible]	Flange	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
3148	15	1.640"	Synchro	1.45	4,800	12.2	115	115	Mark 7 Mod O
[illegible]	15	[illegible]	Synchro	1.45	4,800	12.2	115	115	[illegible]
3159	15	1.640"	Synchro	1.45	4,800	12.2	115	230	
[illegible]	15	1.640"	Synchro	1.0	[illegible]		115	115	
3272	15	1.640"	Synchro	1.0	10,000		115	230	
[illegible]	[illegible]	2"	Synchro	2.35	4,800	[illegible]	115	115	
3217	18	2."	Synchro	2.35	4,800	18.5	115	282	
[illegible]	[illegible]	2"	Synchro	[illegible]	[illegible]	18.0	115	115	
2094	2" OD	2.718"	Flange	3.5	7,200	40.	115	115	Damping Generator
[illegible]	[illegible]	[illegible]	Synchro	[illegible]	[illegible]	[illegible]	115	115	

Many of the above units can be supplied with gear train to your specifications.
Other servos to your requirements.

Write for further details, giving type number.

Other products include Actuators, AC Drive Motors, DC Motors, Motor-Gear-Trains, Fast Response Resolvers, Servo Torque Units, Synchros, Reference Generators, Tachometer Generators, and Motor Driven Blower and Fan Assemblies.

John Oster MANUFACTURING CO.
Your Rotating Equipment Specialist

avionic division
RACINE, WISCONSIN

BURTON BROWNE ADVERTISING

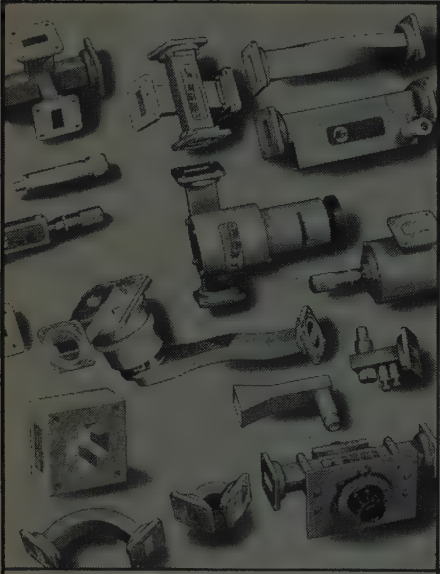
Kearfott

TESTING EQUIPMENT
STANDARD AND CUSTOM
MICROWAVE
COMPONENTS

UNIVERSAL TEST SETS FOR X, K_u, and C BANDS

Combined in one unit are means to measure power—a spectrum analyzer—a unit to measure frequency, and a signal generator.

Each test section is modular in construction, with separate plug-in chassis. Available for X, K_u and C Bands.

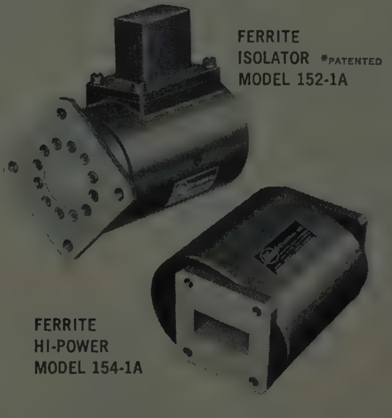


STANDARD microwave equipment for laboratory or production includes attenuators, directional couplers, crystal mixers, wavemeters and other components. Units are available for S, C, X_b, X and K_u Microwave Bands in aluminum or brass.

CUSTOM-DESIGNED Microwave equipment is a Kearfott specialty. Skillful engineering, wide experience, with complete laboratory testing facilities can be brought to bear on your problem. Kearfott can supply special components such as rotary joints, R.F. sources and matched assemblies.

NEW FERRITE ISOLATOR... a useful device with many applications, such as oscillator isolation. This light-weight unit (less than 2 lbs.) improves system performance by reducing long-line loading. It also prevents undesired frequency shift, insures uniform power output with improved transmitted pulse spectrum.

FERRITE Resonance Absorption Transverse Field Isolator for use where high power handling capacity is required. Over a 10% band width this unit has... greater than 9 db isolation, less than 0.4 db insertion loss and VSWR less than 1.03.


FERRITE ISOLATOR *PATENTED MODEL 152-1A
FERRITE HI-POWER MODEL 154-1A

Write today for complete technical bulletins.

Kearfott COMPANY, INC.
LITTLE FALLS, NEW JERSEY
WESTERN MANUFACTURING DIVISION
14844 OXNARD ST. • VAN NUYS, CALIF.

A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

SALES OFFICES

Eastern Office:	Midwest Office:	South Central Office:	Western Area Office:
1378 Main Ave. Clifton, N.J.	188 W. Randolph St. Chicago, Ill.	6115 Denton Drive Dallas, Texas	253 Vinedo Ave. Pasadena, Calif.

News–New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your I.R.E. affiliation.

(Continued from page 126A)

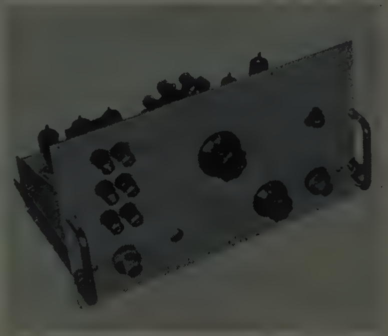
motor driven switch at a 0 to 20 volt level.

All equipment and power supplies are self contained, operate from 115-volt 60-cps single phase power and are mounted in a relay rack 23½ inches wide, 23 inches deep and 68 inches high. Net weight 435 lbs. Special models can be manufactured to customer specifications.

For further information, please write to the firm.

Preamplifier

To overcome the limitations of excessive power drain and sluggish response of a meter movement in recording the RMS value of ac voltages and currents, **Sanborn Co., Industrial Div.**, 195 Massachusetts Ave., Cambridge, Mass., has developed a circuit which produces a dc voltage proportional to the RMS value. The device is the Model 150–2,500 RMS Volt /Ammeter Preamplifier, which plugs into an appropriate Driver Amplifier—Power Supply unit in any Sanborn "150 Series" system.



Typical performance specifications of the new preamplifier, when used with associated Sanborn equipment, are as follows: Type of Reading—True RMS; Voltage Ranges—25, 125, 250 volts; Current Ranges—50 ma, 100 ma, 250 ma, 500 ma, 1 ampere; Full scale Deflection—5 cm.; Overall Tolerance—±3 per cent of full scale, for frequencies between 50 cps and 2 kc. Usable to 4 kc. Rise Time, 0.15 second.

Complete specifications and data are available on request from Sanborn.

(Continued on page 130A)

Designed for one...

... SOUGHT BY MANY

Seeking to overcome the deficiencies in many of today's standard electronic devices, engineers at Airborne Instruments Laboratory created the devices shown here. Though developed for use at AIL, their adaptability for many applications has resulted in a wide demand by manufacturers and users of electronic equipment. Thus, production and sales have become important areas of operations at Airborne.

TYPE 124A WIDE RANGE POWER OSCILLATOR

Frequency Range:	200-2500 mc (in three ranges, 200-300, 300-900 and 900-2500 mc).
Power Output:	300 mc: 8 watts, 600 mc: 20 watts, 1500 mc: 10 watts, 2500 mc: 2.5 watts.
Output Impedance:	50 ohms

$ 2285.

TYPE 40 INTEGRATING AMPLIFIER

The type 40 INTEGRATING AMPLIFIER is a four-tube electronic integrator for use as a component of specialized electronic analogue computers.

The characteristics of the unit especially adapt it for such difficult applications as:

Integration of video or other pulse signals of low duty factor;

long term memory of information derived by intermittent sampling of data.

$ 500.

TYPE 30 PRECISION 30 MC ATTENUATOR

Accuracy: ± 0.2 db at any frequency from 25 to 35 Mc. Counter-type indicator reads attenuation above minimum insertion loss in tenths of a decibel.

Range of Attenuation: 80 db

Input Impedance: 50 ohms (BNC connector)

Output Impedance: 50 ohms (BNC connector)

Minimum insertion loss: 25.0 db (at 30 Mc)

$ 395.

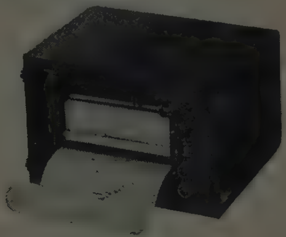
TYPE 373 RECTANGULAR COORDINATE RECORDING SYSTEM

PEN POSITION SYSTEM

Range:	80 db of recorded voltage
Pen Speed:	full scale deflection (10 inches) in 1/4 second.
Accuracy:	static error less than ± 0.25 db dynamic error less than ± 0.4 db at maximum pen speed of 40 inches per second
Input:	audio frequency voltage of fixed frequency in the range 500 to 2000 cps 2 microvolts minimum input from 200 ohm source. Selective amplifier bandwidth 35 cps.

CHART POSITION SYSTEM

20-1/4, 121-1/2, and 729 inches per revolution of device under test. Maximum chart speed 10 inches per second. Reversible chart drive.



$ 8,500.

TYPE 390A MICROWAVE CRYSTAL TEST SET

Accepts ceramic cartridge and coaxial types of both normal and reversed polarities.

Remote test jack permits testing crystals without removing them from receiver

Portable

Self-contained

$ 97.

TYPE 116R POLAR PATTERN RECORDING SYSTEM

Pen Positioning System

Input:
Audio-frequency voltage of fixed frequency between 500 and 2000 cps. Amplifier bandwidth 35 cps. Maximum sensitivity 100 microvolts for full scale deflection.

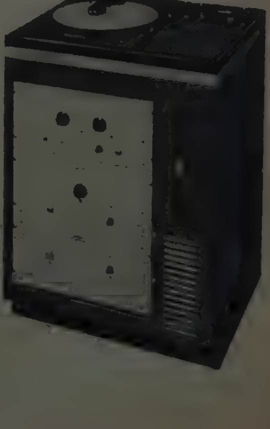
Pen Speed:
15 inches per second.

Accuracy:
Overall system static accuracy ±1% of full scale.

Turntable Positioning System

Input:
1:1 and/or 36:1 synchro signals, 115 volts 60 cps, size 5.

Accuracy:
± Maximum error degree. 0.2° at 6 R.P.M.



$ 7500.

All prices F.O.B., Mineola, N. Y.
Subject to change without notice.

AIRBORNE
INSTRUMENTS
LABORATORY

160 OLD COUNTRY ROAD • MINEOLA, NEW YORK

CRITICAL QUALITY CONTROL
Means the Finest in Frequency Control in
Midland
CRYSTALS

Midland makes more frequency control crystals than anybody else. Millions are used in two-way communications thruout the world.

Only a product of the highest quality rates that kind of demand. That's why you *know* your Midland crystal will do a completely dependable job for you.

The quality of Midland crystals is assured by exacting tests and controls through every step of processing. It's quality you can stake your life on — as our men in the armed forces and law enforcement do every day.

ML-200 Series
for color television
(also available encapsulated)
ML-6 Series
for ranges 1.0 mc to 75.0 mc
MIDLAND MINIATURES
for specified performances
Other standard types for various ranges.
Specials developed and produced to individual requirements.
MIDLAND MFG. CO.
ML-6
ML-18

Whatever your crystal need — conventional or highly specialized... when it has to be exactly right, contact

Midland Manufacturing Co., Inc.
3155 Fiberglas Road • Kansas City, Kansas

WORLD'S LARGEST PRODUCER OF QUARTZ CRYSTALS

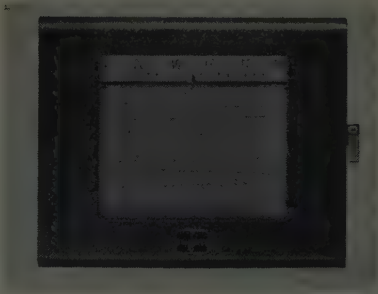
News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 128A)

High-Speed Recording Potentiometer

A recording wide-strip potentiometer which features full-scale pen travel in 0.4 second has just been announced by **The Bristol Co.**, Waterbury, Conn.



The pen of the High-Speed Electronic Dynamaster recorder makes the traverse across the 11 inch chart scale in 0.4 second without overshoot at the end. The "deadband" of the instrument is less than 0.1 per cent of the full-scale span. It is offered with standard ranges as low as 1 millivolt for full scale, with source resistance up to 10,000 ohms.

The high-speed recorder has proved useful for recording rapidly changing variables such as those encountered in rocket and jet-engine testing, wind tunnel investigations, and laboratory tests. Chart speeds up to 4 inches/second are offered. A specially designed recording pen and pen carriage are used to assure continuous inking at the high speeds, and to prevent damage when the pen comes to the end of the scale.

A Thyrite voltage regulator is used in the field circuit of the feedback damping generator to provide constant damping voltage, regardless of line voltage variation. The amount of damping is adjustable, as is the amplifier-gain setting.

For further information, including chart sections showing recordings of the dynamic characteristics of the instrument, write the company.

(Continued on page 132A)

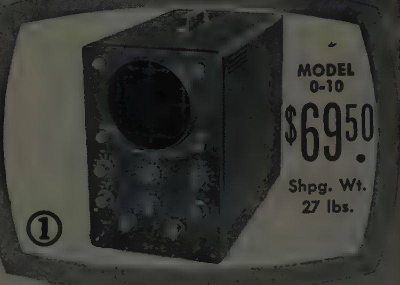
for service and lab. work

Heathkit
PRINTED CIRCUIT
OSCILLOSCOPE KIT
FOR COLOR TV!

① Check the outstanding engineering design of this modern *printed circuit* Scope. Designed for color TV work, ideal for critical Laboratory applications. Frequency response essentially flat from 5 cycles to 5 Mc down only 1½ db at 3.58 Mc (TV color burst sync frequency). Down only 5 db at 5 Mc. New sweep generator 20-500,000 cycles, 5 *times* the range usually offered. Will sync wave form display up to 5 Mc and better. Printed circuit boards stabilize performance specifications and cut assembly time in half. Formerly available only in costly Lab type Scope. Features horizontal trace expansion for observation of pulse detail — retrace blanking amplifier — voltage regulated power supply — 3 step frequency compensated vertical input — low capacity nylon bushings on panel terminals — plus a host of other fine features. Combines peak performance and fine engineering features with low kit cost!

Heathkit TV
SWEEP GENERATOR KIT
ELECTRONIC SWEEP SYSTEM

② A new Heathkit sweep generator covering all frequencies encountered in TV service work (color or monochrome). FM frequencies too! 4 Mc — 220 Mc on fundamentals, harmonics up to 880 Mc. Smoothly controllable all-electronic sweep system. Nothing mechanical to vibrate or wear out. Crystal controlled 4.5 Mc fixed marker and separate variable marker 19-60 Mc on fundamentals and 57-180 Mc on calibrated harmonics. Plug-in crystal included. Blanking and phasing controls — automatic constant amplitude output circuit — efficient attenuation — maximum RF output well over .1 volt — vastly improved linearity. Easily your best buy in sweep generators.



②
MODEL TS-4
$49.50
Shpg. Wt. 16 lbs.

Heath
COMPANY
A SUBSIDIARY OF DAYSTROM, INC.
BENTON HARBOR 4, MICH.

WRITE FOR FREE CATALOG
...COMPLETE INFORMATION

Jennings
RADIO ®
VACUUM ELECTRONIC COMPONENTS
NEW!

JENNINGS VACUUM TRANSFER RELAYS

with self contained DC coil easily mounted by Aircraft Marine Products in their pulse forming networks

THREE Type RD1 Normally Open Vacuum Relays are soldered to the side of the pulse forming network so that each evacuated contact enclosure is immersed in silicone oil with the rest of the network. The use of these relays therefore results in fewer high voltage bushings, contacts that will not contaminate, and short lead lengths that minimize inductance and stray capacitance. This construction also permits the built-in DC actuating coils to be removed without disturbing the sealed network.

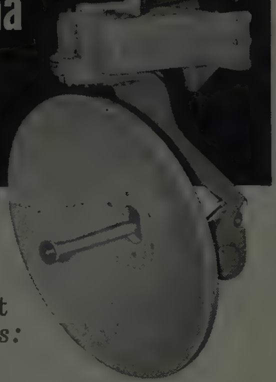
These relays easily meet standard vibration tests of 10 to 55 cps and shock tests of 15 G. Temperature requirements are −55° C. to +85° C. with 30 minute operation at 105° C.

The RD1 is a SPST relay, available with either normally open or normally closed contacts. A similar relay (Type RE2) has SPDT contacts and slightly larger models (Type RM2 and RM4) are made with 2PDT and 4PDT contact arrangements. These units have peak working voltage ratings up to 12,000 volts and continuous RF current ratings of 10 amperes rms at frequencies up to 30 mc. It is also possible to make and break under load with fast break times of less than 10 milliseconds. Switch capacitances are as low as 0.1 mmfd and contact resistances are as low as .005 ohms. As their contacts are sealed in a vacuum, contact resistance does not increase with usage. This factor makes them excellent general purpose relays for DC switching.

Write us regarding your own relay problems.
Literature mailed on request.

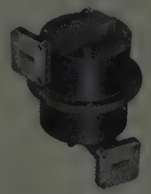
JENNINGS RADIO MANUFACTURING CORPORATION • 970 McLAUGHLIN AVE. P.O. BOX 1278 • SAN JOSE 8, CALIFORNIA

Complete line of Microwave Components
From Magnetron Through Antenna
Designed and Produced
by Airtron INC



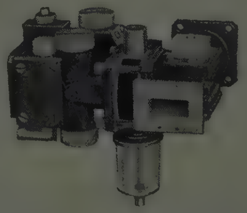
Whether it is "Standard" plumbing or designing an entirely new waveguide system, Airtrons *complete* facilities can substantially reduce the time and expense between concept and reality. *Here are just a few examples:*

FLEXIBLE WAVEGUIDE ASSEMBLIES. Flexible double ridge waveguide for airborne commercial weather radar. Beryllium copper flexible in convolute or type S construction. Waveguide sizes from Ka-Band to 9.750" x 4.875" I.D. in standard lengths or preformed to your installation.



ROTARY JOINTS. Waveguide rotary joints of the coaxial or circular waveguide type in many frequency ranges designed for high power VSWR performance. Produced in volume to your specifications or designed to meet requirements.

WAVEGUIDE SWITCHES. For frequent, rapid switching to or from noise sources, signal generators, dummy loads, etc. Reversing switches for dual channel systems in GCA or microwave relay radars. Low VSWR, excellent crosstalk characteristics, and high peak power performance. Switching tees, ferrite switches and other special designs.



PRECISION CAST BALANCED MIXERS. Low noise figures over a broad bandwidth are achieved by compact balanced mixer design and use of latest type crystals. Equipped with coaxial or waveguide crystal mounts for frequencies up to 40,000 mc. Standard and special types available. Mixer-Preamp packages designed to meet your requirements.

ANTENNAS AND ASSOCIATED COMPONENTS. Horn antennas and feeds for fire control, countermeasure, guided missile, navigational or weather radars. Designed to your specifications and produced in the Airtron precision casting foundry. Complete with rotary joints, flexible sections and associated waveguide assemblies.

OTHER AIRTRON PRODUCTS

Twists, Magnetron Transitions • RF and Pressure Contact Flanges and Gaskets • Quick Disconnects • RF Pressure Windows • Short-Slot Hybrids • Antenna Components • Test Horns • Dummy Loads • Jet Engine Power Cables and Thermocouples • Waveguide Bending and Twisting To Your Specifications.

NEW PRODUCT DEVELOPMENT PROGRAM

Including such MICROWAVE FERRITE COMPONENTS as duplexers, waveguide switches, high and low power load isolators, variable absorption attenuators and other special ferrite devices.

Airtron INC.
Dept. C
Linden, N. J.

Branch Offices: Albuquerque • Boston • Chicago • Dallas • Dayton • Detroit • Kansas City • London • Los Angeles • Montreal • Renfrew • San Francisco • Seattle • Toronto • Washington

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your I.R.E. affiliation.

(Continued from page 130A)

VT Volume Level Indicator

Kilpatrick Electronic Laboratory, Box 61, Norristown, Pa., announces a versatile vacuum-tube audio level indicator. Unlike conventional VU meters, the model 5514 may be used anywhere in any audio system from preamplifier to speaker or recording head.

The input impedance is 1 megohm and reference level ($\frac{3}{4}$ scale) is adjustable from 0.7 to 350 volts peak. Feedback stabilization makes the indication independent of line and tube fluctuations. Adapter-scale assemblies are available for rapid connection at the power amplifier stage or connection may be made to the "monitor" or spare output jack. The unit may be up to several hundred feet from the signal source. The unit is available in three forms: a $3\frac{1}{2}$ inch panel mounting (not shown), a $4\frac{1}{2}$ inch panel and a $4\frac{1}{2}$ inch "portable" in a gray hammerstone cabinet. For application notes and prices, write to the company.

Raytheon Builds Laboratory at White Sands

Raytheon Mfg. Co., Waltham, Mass., announced today that it has established a laboratory at the White Sands Proving Grounds, Las Cruces, N. M. The laboratory will conduct tests and evaluation of equipment which Raytheon, as prime contractor, is developing for Army Ordnance.

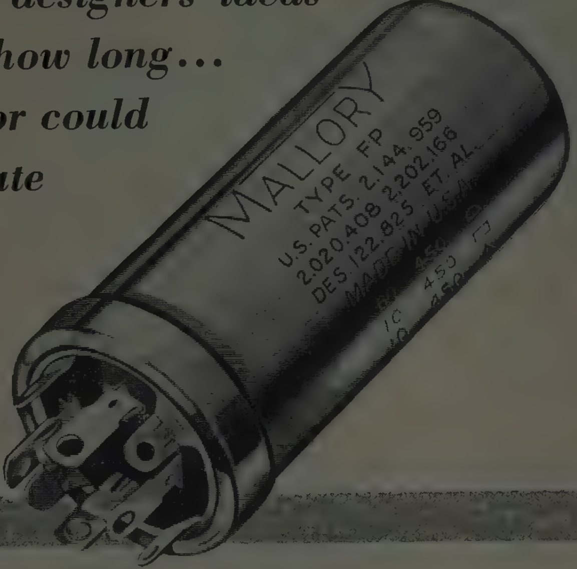
A large building on the base has been allocated to Raytheon, and the tools and equipment necessary to equip the facility are being furnished by the firm and by the armed forces.

The laboratory is being set up by the missile and radar division

(Continued on page 134A)

P.R. MALLORY & CO. Inc.
MALLORY

This capacitor changed designers' ideas about how well...and how long... an electrolytic capacitor could be relied upon to operate



On Electrolytic Capacitors...

Mallory FP is the Sign of Dependability

AUTOMATIC CONTROLS

An example of a field served by Mallory

The long life and uniform high quality of Mallory electrolytic capacitors are particularly valuable, in modern electronic instrumentation, which must deliver consistent and uninterrupted service as the "brainpower" guiding complex production processes.

Also serving the manufacturers of measurement and control equipment are other Mallory precision components . . . contacts, resistors, controls, switches, rectifiers, vibrators and mercury batteries. Because of this wide range of components, Mallory engineers have a unique fund of experience—available to assist you in meeting special requirements and in balancing related circuit elements.

"FP" is the mark of a unique capacitor construction, pioneered and perfected by Mallory, which sets the industry's standards for performance and service life. It signifies these features:

- Ability to operate at ambients of 85° C without derating.
- High ripple current rating; suitable for use with metallic rectifiers and in doubler circuits.
- Exceptional life, in service and on the shelf.
- Compact, standardized case size.
- Quick, economical twist-prong mounting and variety of printed circuit mountings.

For premium performance and reliability . . . without premium price . . . be sure to specify Mallory FP Capacitors. Our capacitor engineers will be glad to consult on your circuit requirements, to assist in effective application and often to aid in simplification of circuitry. For technical data, or for a discussion of your particular requirements, write or call Mallory today.

Serving Industry with These Products:

Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

Parts distributors in all major cities stock Mallory standard components for your convenience.

Expect more... Get more from

P.R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

Specialists

in BROAD-BAND Amplification

Standard adaptable amplifiers delivered from stock...
Expert engineering service for your particular broad-band problems...
Development service on all types of broad-band systems...
Ask for bulletin E-13

Here are a few typical I.F.I. amplifiers available:

M 200 Miniature i.f. Amplifiers
Band Centers . . . . 30 or 60 mc
Band Width . . . . 2 to 10 mc

Model 400 High Power Distributed Amplifier
Output Power . . . . 100 w CW
Band Pass . . . . 300 mc

Model 500 Distributed Amplifier
Output Power . . . . 3 w
Band Pass . . . . 220 mc

TV 100 Broad-Band Amplifiers
Gain . . . . 50 db
Band Pass . . . . 52-90 or 171-219 mc

INSTRUMENTS FOR INDUSTRY, Inc.
159 GLEN COVE RD., MINEOLA, N. Y. • PHONE: PIONEER 2-5300

Representatives

G. E. Moxon
422 La Jolla Ave.
San Mateo, Calif.

G. E. Moxon
3709 So. Robertson Blvd.
Culver City, Calif.

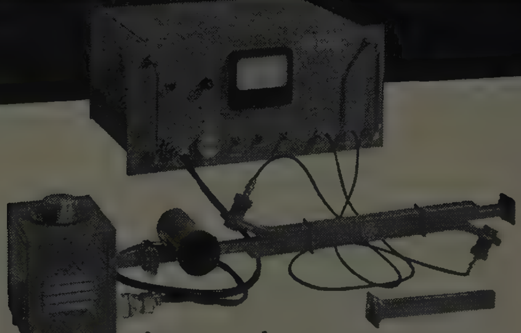
Hunter & Salsbury, Inc.
258 Herricks Rd.
Mineola, N.Y.

Rush Drake Assoc.
1806 Bush Pl.
Seattle 44, Wash.

John J. Goode Assoc.
211 [illegible] St.
Ashland, Mass.

CONTINUOUS, DIRECT-READING

X-BAND VSWR MEASUREMENT



better than

2% overall accuracy!

For speedy and accurate VSWR measurements in laboratory or production use, the CTI Model 110B Measuring System reads directly, is continuously tunable from 8,500 to 9,600 mc.

SPECIFICATIONS

Two VSWR Ranges:	1.02 to 1.2; 1.2 to 2.5
Attenuation Scale:	0 to ∞; 1.5 db midscale
Waveguide Fitting	UG-39/U
Directional Couplers, directivity	over 40 db

COLOR TELEVISION INCORPORATED

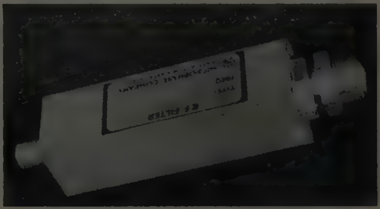
SAN CARLOS 2, CALIFORNIA

(Continued from page 132A)

of Raytheon's Equipment Operations, and its functions are being integrated with the firm's guided missile test facilities at Point Mugu, Calif., near Oxnard, managed by J. H. Leiper. Robert Skidmore has been transferred from Pt. Mugu to coordinate the work at the White Sands laboratory. Most of the personnel at the new installation have been assigned from the company's employees at the West Coast plant and the missile and radar division's development laboratory overlooking the Hanscom Air Force Base in Bedford, Mass.

Microwave Filters

Compact low-pass coaxial filters, for use in the uhf and microwave region from 100 to 200 mc, have been accounted by **Microphase Corp.**, P.O. Box 1166, West Acton, Mass. Featuring insertion loss less than 1 db, the attenuation of Series LS rises to 60 db within 25 per cent and that of Series LF within 13 per cent of the cut-off frequency. These filters are useful for suppression of harmonics and spurious radiation from transmitters and receivers, and for laboratory measurements.



The filters, rated at 100 watts, are 3 to 8 inches long, and weigh 5 to 9 ounces, dependent upon cut-off frequency. They are resistant to vibration and shock, and can meet the requirements of MIL-E-5400 and MIL-E-5422G. Type N connectors, one male and one female, are normally furnished; other connectors, including types BNC, C and uhf, can be provided.

Standard cut-off frequencies available are 100, 200, 400, 700, 1,000 and 2,000 mc. Other low-pass, as well as high-pass and band-pass filters, are available with cut-off frequencies from 10 to 10,000 mc.

(Continued on page 136A)

What is this?

New wide-range linear
electrostatic loudspeaker 40 c/s—20 kc/s.
Featured in May 1955 Wireless World. High fidelity reproduction is covered by frequent articles.

Up-to-date news of every British development

Wireless World

Britain's chief technical magazine in the general field of radio, television and electronics. Founded 45 years ago, it provides a complete and accurate survey of the newest British techniques in design and manufacture. Articles of a high standard cover every phase of radio and allied technical practice, with news items on the wider aspects of international radio. Theoretical articles by recognised experts deal with new developments, while design data and circuits for every application are published. WIRELESS WORLD is indispensable to technicians of all grades and is read in all parts of the world.

Monthly: $4.50 a year. Three years $9.00

Recent editorial features: *Wide Range Electrostatic Loudspeakers* — Principles of design for operation with negligible distortion at low as well as high frequencies; *V.H.F. and U.H.F. Propagation; Transistor Equivalent Circuits; Non-Linearity Distortion; Developments in Sound Reproduction.*

Wireless Engineer

Journal of radio research and progress, produced for research engineers, designers and students in the fields of radio, television and electronics. Its editorial policy is to publish only original work, and its highly specialized content is accepted as the authoritative source of information for advanced workers everywhere. The journal's Editorial Advisory Board includes representatives of the Department of Scientific and Industrial Research, the British Broadcasting Corporation, and the British Post Office.

Monthly: $7.50 a year. Three years $15.00 (including annual Index to Abstracts & References).

Recent editorial features: *Pulse Response of Signal Rectifiers; Junction Transistor Trigger Circuits; Waveguide Phase Changer; Visual Impedance-Matching Equipment; Ferromagnetic Loop Aerials; Differential-Amplifier Design; Waveguides and Waveguide Junctions.*

MAIL THIS ORDER TODAY

To: ILIFFE & SONS LTD., DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1., ENGLAND

Please forward..for 12 months/36 months. Payment is being made*..................

NAME..

ADDRESS..

CITY...ZONE..............................STATE..............................

**Payment can be made by Banker's draft or International Money Order.*

PRO I.R.E.

FOR SCIENCE and INDUSTRY

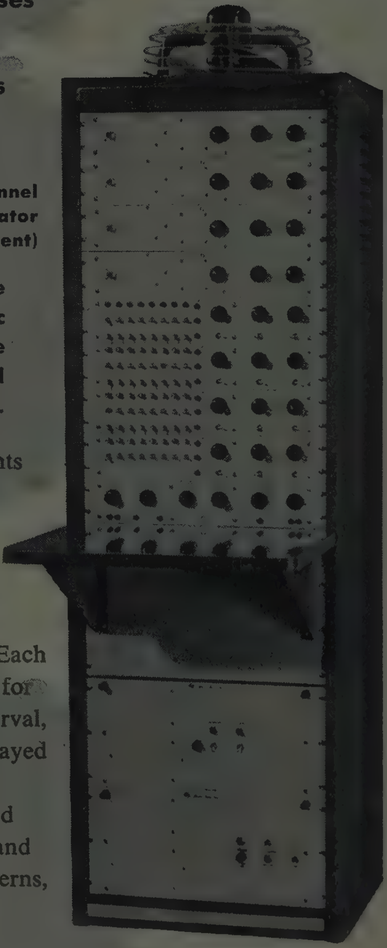
Electro-Pulse

PULSE CODE GENERATORS

and Magnetic Core Testing Equipment

HIGH STABILITY . . . *CONSTANT CURRENT OUTPUT*

- Eight-Interval Pulse Code
- Two-Interval Controlled Repeat
- Variable Width and Delay Pulses
- Amplitude Variable to 1 Amp. per Channel
- Independently Coded Channels
- Mixed Output—2 Neg. and 2 Pos. Channels



Model 5000A Four-Channel Pulse Code Generator (Constant Current)

Designed for: Magnetic Memory Core Testing — Switch Core Testing — Magnetic Material Pulse Response Studies — Pulse Code Transmission System Design and Test — Multi-pulse Circuit Development.

The Electro-Pulse 5000 series instruments utilize unique pulse feedback circuitry to provide the pulse current stability required for accurate determination of magnetic core characteristics. The flexible coding system is based on eight intervals with controllable repeat of first two intervals. Each channel Control Unit selects (independently for each interval) a pulse at start of the interval, no pulse during interval, or a pulse delayed within the interval. Pos. and neg. output units and Electro-Pulse block-unitized construction allow combination of control and output units to form required code patterns, pulse current amplitudes, and waveforms.

Write for Complete Data: Our Bulletin 5000A/1

The constant current Pulse Code Generator series is the latest addition to the Electro-Pulse instrumentation line. Others: Precision Pulse Generators, Analog and Digital Time Delay Generators, Megacycle Pulse Generators, Pulse Oscillators, Variable Pulse Generators, Pulse Voltage and Current Calibrators.

Model 5050A PULSE CODE GENERATOR

Representatives in Major Cities

EP Electro-Pulse, Inc.

11861 TEALE STREET, CULVER CITY, CALIFORNIA
Telephones: EXmont 8-6764 and TExas 0-8006

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your I.R.E. affiliation.

(Continued from page 134A)

Electronic Null Indicator

A new high-sensitivity, high-stability electronic galvanometer designed to replace spotlight galvanometers used for bridge and potentiometer measurements has been announced by the **Shallcross Manufacturing Co.**, Collingdale, Pa.

The Type 1965 Null Indicator, which has a response time of 1 second, is unaffected by mechanical vibration of any sort.

Current sensitivity of the new instrument is greater than 2×10^{-10} ampere. Voltage sensitivity is better than 1 microvolt per millimeter scale division. High sensitivity plus the instrument's high input impedance (5,000 ohms) is a decided advantage for measurements of high resistance. Sensitivity may be altered to specific jobs by means of an adjustable front-panel control.

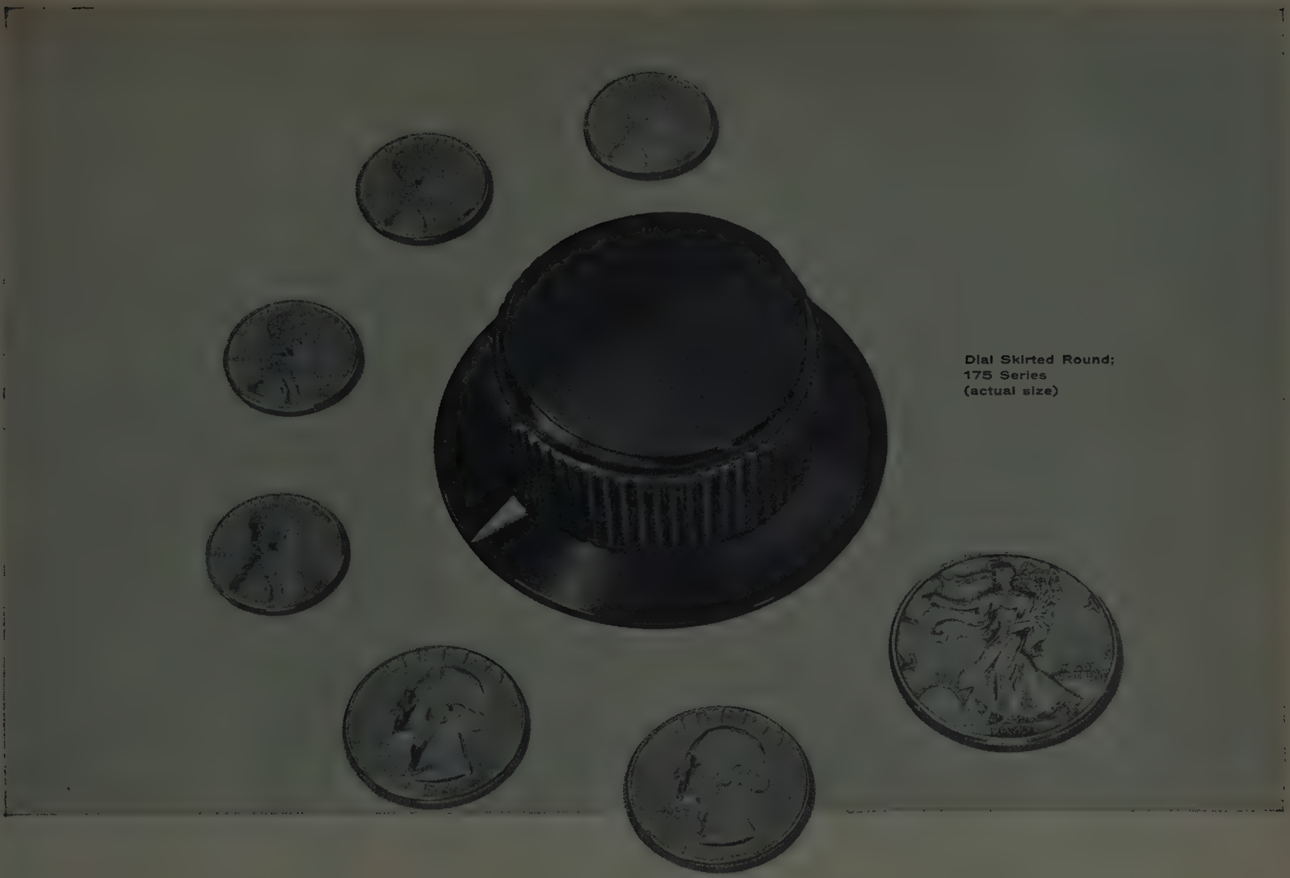
The null indicator and its integral 115 volt, 60 cps power supply are housed in a cabinet 17 deep by 6 wide by $8\frac{1}{2}$ inches high. Weight is 14 pounds. All controls and multi-purpose binding posts are located on the front panel.

Write for Shallcross Engineering Bulletin L-42.

Monitor

The Type 360 Indicator, manufactured by **Tektronix, Inc.**, P.O. Box 831, Portland 7, Ore., contains a 3-inch flat-faced cathode-

(Continued on page 138A)



Dial Skirted Round;
175 Series
(actual size)

Why spend $1.04 for this knob?

Sure, you could pay less for an ordinary knob, but the premium price of the Raytheon Standard Control Knob is well worth the difference! Here's why:

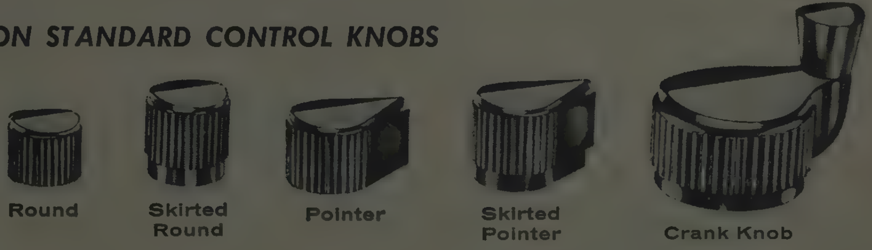
Raytheon knobs conform to government specifications for material, high and extreme temperature, humidity, salt spray, vibration, impact and torque. They are handsomely designed and molded of "Tenite II." They have anodized aluminum inserts with dual Allen head set screws. Most important, Raytheon knobs offer the smartly turned professional look that adds so much to the fine appearance of your product.

You put time, skill, money *inside* your equipment. You incorporate the finest circuitry; you select each component with care—your goal is quality in every detail. Naturally, this means quality *outside*, too. The right knobs, the finest knobs give the important finishing touch. They help convince your customers that yours is thoughtful, thorough craftsmanship.

Let us send you complete information on the finest control knobs available today. Write Dept. 6120, or see your electronic supplier.

OTHER FINE RAYTHEON STANDARD CONTROL KNOBS

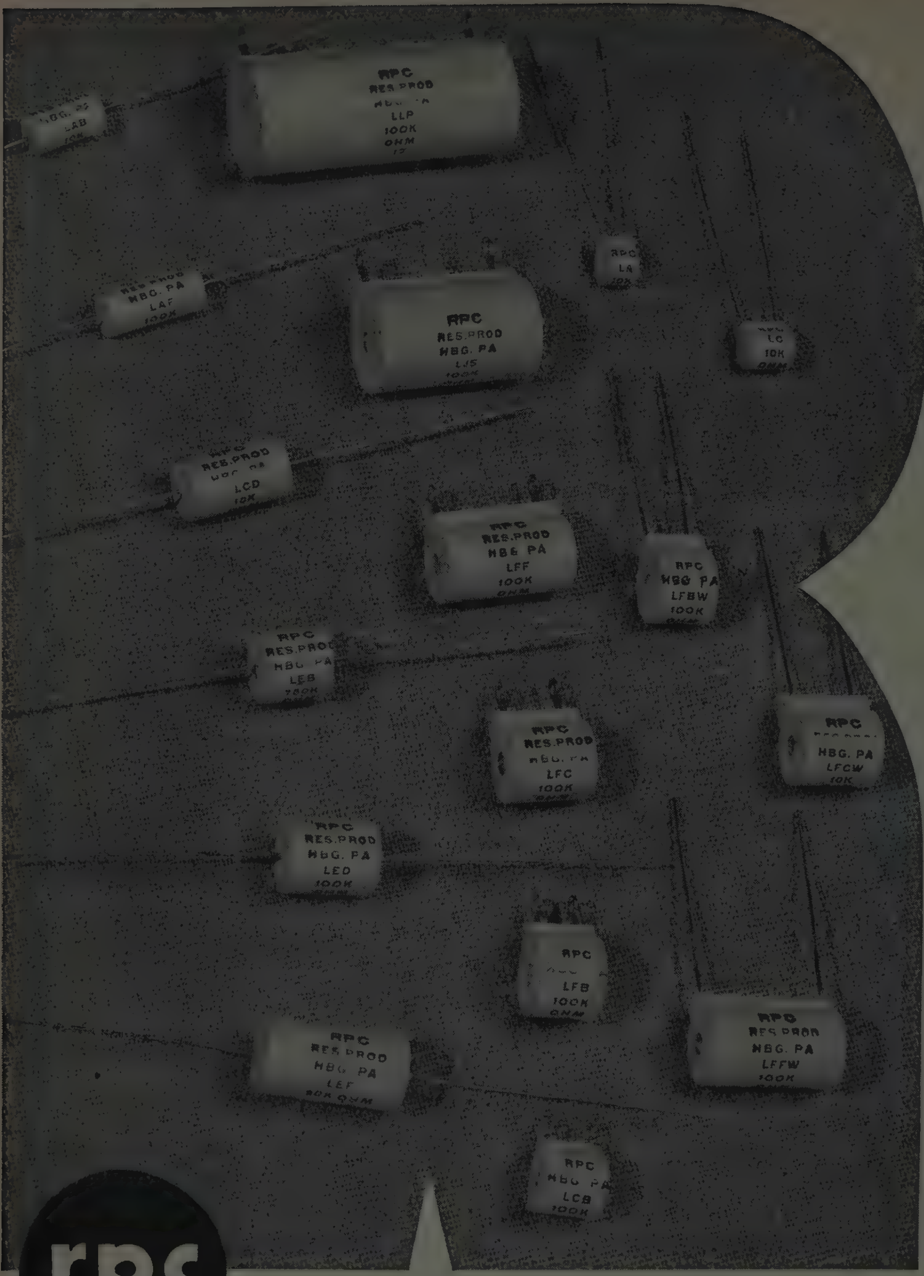
Prices range from 69¢ to $3.10



Round — Skirted Round — Pointer — Skirted Pointer — Crank Knob

RAYTHEON

RAYTHEON MANUFACTURING COMPANY
Equipment Marketing Division
Waltham 54, Mass.



Encapsulated Precision Wire Wound Resistors Defy Shock, Vibration and Extreme Changes

Completely sealed in epoxy resin, RPC has engineered Type L Resistors that are protected against extremes of humidity, temperature, altitude conditions, corrosion, shock and mechanical damage. Type L Resistors meet requirements of military specification MIL-R-93A, Characteristic A.

RPC can supply Type L with lug terminals or wire leads in a complete line of standard, midget and sub-miniature sizes. All resistors are wound with low temperature coefficient alloys unless otherwise specified. Resistance tolerances to ±0.02% available. Resistors can be furnished with special temperature coefficients and matched characteristics.

Networks, ratio resistors, special assemblies and types for high temperature operation are made to meet specific requirements. Our Engineering Department is available for consultation on resistor problems.

Sales representatives in principal cities of the United States.

Write for additional information without obligation.

RESISTANCE PRODUCTS CO.
914 SOUTH 13TH ST. • HARRISBURG, PENNA.

Manufacturers of High Quality Resistors
Precision Wire Wound — High Voltage — High Megohm — High Frequency

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 136A)

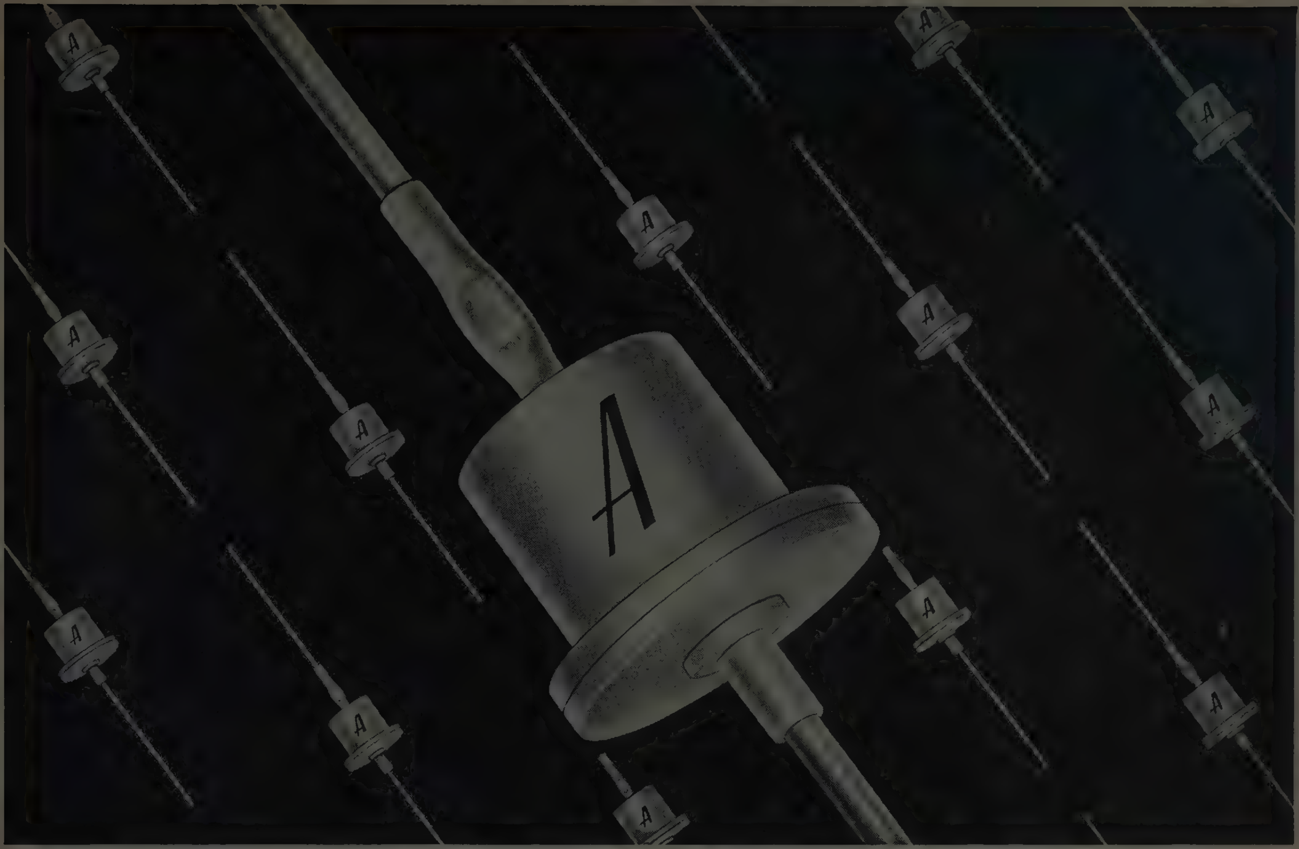
ray tube, accelerating-voltage supply, vertical amplifier with a sensitivity of 0.05 v/div, and a calibrated vertical attenuator. It is designed to be powered by a Tektronix Type 160 or 160A Power Supply and to receive its sweep and unblanking voltages from a Tektronix Type 162 Waveform Generator; it can, however, be operated from any source of the proper voltages and waveforms.

A Type 360 can take the place of a bulkier oscilloscope in single monitoring applications, or several can be used along with other instruments as building blocks in complex sequence-control and monitoring systems. Features include: dc to 500 kc vertical-amplifier passband; four calibrated sensitivities from 50 mv/div to 50 v/div with 10-to-1 attenuator for continuously variable sensitivities from 50 mv/div to 500 mv/div. Horizontal gain control permits sweep calibration. Adapted to rack mounting. Weight 9 pounds. Price $195 f.o.b. Portland (Beaverton), Ore.

Vibration Measurement

A new publication, *Measurement of Vibration*, has been made available by the **General Radio Co.,** 275 Massachusetts Ave., Cambridge 39, Mass. This booklet, consisting of 64 pages, covers the meaning of vibration terms, description of vibration-measuring instruments, procedures, typical examples, and

(Continued on page 140A)



AUTOMATIC...a dependable source for
SILICON POWER RECTIFIERS

Medium Power Series of 6 Types. Ratings up to 600 P.I.V. and 300 Ma.

Featuring:

- **Infinitesimally small reverse leakage current (Reverse resistance of 1000 megohms)**
- **Ambient temperature range: — 55°C to 150°C**
- **No de-rating up to 100°C**
- **Extremely low forward resistance (1 ohm)**
- **Highest rectification ratios (10^9)**
- **Convenient coaxial pigtail leads**
- **All-welded hermetic seal for long life**

Automatic Silicon Power Rectifiers are ideally suited for use in all types of miniaturized equipment. Complete technical data covering the six types (1N440 to 1N445) already available is contained in a 4 page illustrated catalog available on request. Your inquiry will receive prompt attention.

ABSOLUTE MAXIMUM RATINGS (For 55°C Ambient)	1N440	1N441	1N442	1N443	1N444	1N445
Peak Inverse Voltage (volts)[1]	100	200	300	400	500	600
D.C. Output Current (ma.)[2]	300	300	300	300	300	300
Peak Forward Current (amps.)	1.5	1.5	1.5	1.5	1.5	1.5
Full Load Voltage Drop (volts)	1.5	1.5	1.5	1.5	1.5	1.5
Reverse Current at Rated P.I.V. (microamps.)	0.30	0.75	1.00	1.50	1.75	2.00

1. Continuous reverse voltage equal to the P.I.V. may be applied.

2. For ambient temperatures greater than 100°C, de-rate the D.C. output current by 60 ma. for each 10°C above 100°C.

NOTE: Silicon power rectifier types with higher peak inverse voltages than those shown above are available to meet specific requirements.

Every part Automatic uses
...Automatic makes.

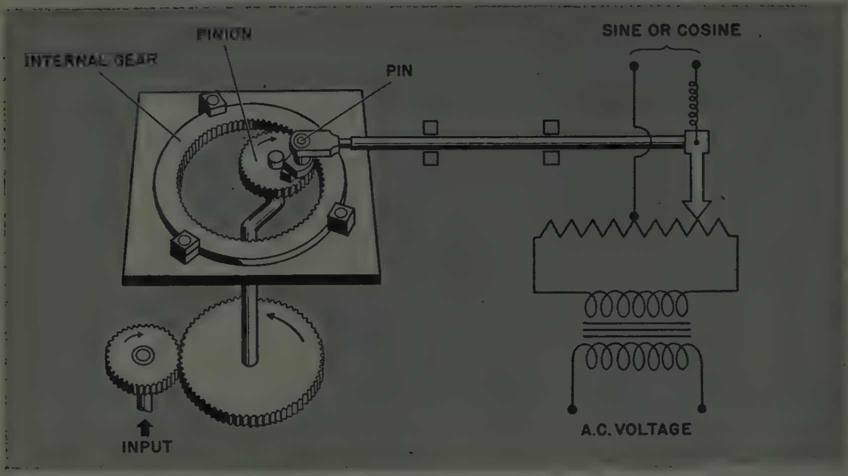
AUTOMATIC*
MANUFACTURING
CORPORATION
Subsidiary General Instrument Corporation

MASS PRODUCERS OF
ELECTRONIC COMPONENTS

65 GOUVERNEUR ST.,
NEWARK 4, N. J.

*T.M. Reg. U.S. Pat. Off.

SINCE 1915 LEADERS IN AUTOMATIC CONTROL



Ingenious electro-mechanical device generates sine or cosine function

From a combination of mechanical and electrical principles, Ford Instrument Company engineers have produced and patented an electro-mechanical device to generate sine and cosine functions. The mechanical portion is an internal-gear angle resolver. It consists of two gears — an internal gear and a pinion. Because the pinion has exactly half the number of teeth as the internal gear, the pin on its pitch circle traces a straight line when the pinion rolls inside the angle gear.

Furthermore, the displacement of the pin relative to the center of the internal gear is proportional to the sine (or cosine) of the roll angle of the pinion.

If a linear potentiometer is now placed along the diameter of the internal gear and a potentiometer slider is fastened to the pin on the pinion, the voltage picked off by the brush is proportional to the sine (or cosine) of the angle.

Two such systems, connected in tandem, produce simultaneously both the sine and cosine functions.

This is another example of Ford Instrument engineering ingenuity. What appears on the surface to be a complex problem is solved by the combination of well-known principles.

Perhaps you have a problem that could benefit from Ford Instrument experience. Ford Instrument engineers work every day with systems using mechanics, electronics, hydraulics, electro-mechanics, magnetics, atomics. How can Ford help you?

79

FORD INSTRUMENT COMPANY
DIVISION OF SPERRY RAND CORPORATION
31-10 Thomson Avenue, Long Island City 1, N. Y.

ENGINEERS
of unusual abilities can find a future at FORD INSTRUMENT COMPANY. Write for information.

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 138A)

interpretation of results. A short section is devoted to the human response to mechanical vibration.

Unwanted vibration, like noise, plagues nearly every industry and plant at one time or another. It is also true that there are many types of desirable vibrations. The first step toward understanding what is happening in all these cases is the measurement of the vibration, and a useful guide for this work is the "Measurement of Vibration." Copies are available from the General Radio.

Germanium Power Rectifiers

A new series of germanium diffused junction power rectifiers now available in production quantities for general industrial use, has been announced by **Federal Telephone and Radio Co.,** 100 Kingsland Rd., Clifton, N. J., a division of International Telephone and Telegraph Corporation. The rectifiers—1N91, 1N92 and 1N93—have a reverse current at least 20 per cent lower than Radio, Electronic and Television Manufacturers Association specifications for the type.

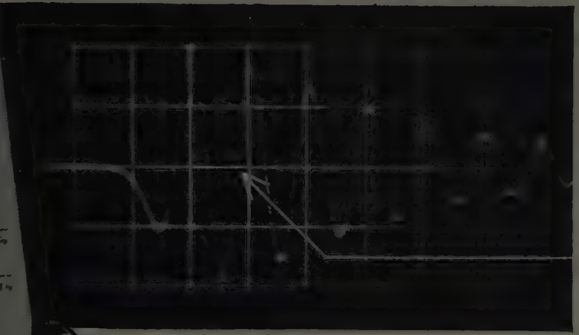
The rectifiers are suited for blocking, magnetic amplifier, and magnetic control applications. They can replace thermionic diodes in computers, and, in addition, their low capacitance permits the passage of frequencies up to 50 kc, making them suitable for such uses as carrier-type servo amplifier rectifiers.

Also available in production quantities is the 1N368, a new germanium rectifier designed for magnetic amplifiers and blocking applications where extremely high forward-to-reverse current ratios are required. The 1N368 meets all RETMA specifications.

The respective RMS input voltages for the 1N91, 1N92, 1N93,

(Continued on page 142A)

1100-cm/μsec writing rate!



Arrow indicates 1100-cm/μsec writing-rate point on 100-mc damped oscillation, displayed on single 0.01 μsec/cm sweep of Type 517A Oscilloscope with T54P11H crt. Recorded on 35-mm TRI-X film at f 1.9 with 4.2 to 1 reduction, developed 26 minutes in D-19 at 68° F.

TYPE 517A CATHODE-RAY OSCILLOSCOPE
TEKTRONIX "SCOPE-MOBILE"
POWER SUPPLY
TYPE 517A CATHODE-RAY OSCILLOSCOPE

The Tektronix Type 517A Cathode-Ray Oscilloscope has the high writing rate, faithful transient response, fast sweeps, and dependable stability necessary for accurate analysis of single high-speed occurrences. Improvements in several performance areas, made possible by the development of a new Tektronix high-voltage cathode-ray tube, make the Type 517A even more useful than its famous predecessor, the Type 517. Sensitivity of the Type 517A is double that of the Type 517, both sweep and vertical linearity are improved, and the viewing area is increased to a full 4 cm by 8 cm. An automatic duty-cycle limiter prevents accidental damage to sweep-circuit components. The exceptional performance characteristics and accurate display of the Type 517A can speed up progress in work involving high-speed transients.

Transient Response—Risetime seven millimicroseconds.
No overshoot or ringing.

Maximum Sensitivity—0.05 v/cm.

Sweep Range—Eleven calibrated sweeps
from 0.01 μsec/cm to 20 μsec/cm. Each can be adjusted to the accuracy of an external standard.

Regulated Accelerating Potential—
24 kv on T54P11H Tektronix metallized precision cathode-ray tube.

Low Displacement Error—
Less than 1% of 8 cm horizontal, less than 2% of 2 cm vertical.

Rate Generator—
15 to 15,000 cycles, accurate within 5% of full scale.

Amplitude Calibrator—
Pulse-type, accurate within 4% of full scale.

Regulation—
All dc supplies electronically regulated. Indicator-unit heater voltages regulated.

Calibrated Horizontal-Position Vernier

Price $3500

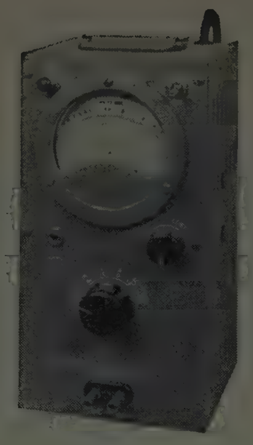
f.o.b. Portland (Beaverton), Oregon

Includes indicator unit, power-supply unit, scope-mobile, cathode-follower probe, 7-step attenuator unit, viewing hood, bezel, 170-ohm cable.

Complete specifications and information on demonstration schedules are available from your local Tektronix Field Office or Representative, or from . . .

Tektronix, Inc.

P. O. BOX 831, PORTLAND 7, OREGON
CYpress 2-2611 • Cable: TEKTRONIX



CML's MODEL 1520

VTVM

OFFERS

1. Voltage Range —500 micro volts to 500 volts.
2. Frequency Range —15 cps to 250 KC.
3. Accuracy —±2%.
4. Input Impedance —2 megohms with 15 uufd shunt capacity.
5. Stability —Less than 1% change with line voltage variation of 105-125 volts.
6. Price —$200.00 net f.o.b. Plainfield, New Jersey

COMMUNICATION MEASUREMENTS LABORATORY, INC.
350 LELAND AVE., PLAINFIELD, N.J.

MINIATURIZE with SUPEREX

VARI-CHOKE

STOCK SIZE
VARIABLE INDUCTANCES

HIGH INDUCTANCE RATIO—a series of variable inductances with a range as high as 10 to 1 within physical dimensions not considered possible until the introduction of the Ferrite Core.

Available in 7 stock sizes covering range of 40 microhenries to .5 henry. Other values to specification.

WRITE for full line catalog:
INDUSTRIAL
DIVISION
Dept. I-11

Superex Electronics Corp.
Successor to Grayburne
4 Radford Pl., Yonkers, N.Y.

BERYLLIUM COPPER
Silvercote ®
titanium
phosphor bronze
ALUMINUM
OTHER NON-FERROUS
Send for descriptive folder.

Special Purpose WIRE

Consider WIRE and the importance of its function in your product. Whether a highly engineered application or a simple stapling purpose, your choice of the proper alloy or composition, temper and type of wire could mean success or failure during crucial test.

round ● flat — square ■ half-round ▬

Precision gauges from ⅛ to .002.

SPRING WIRE — WIRE FOR INSTRUMENTS — ELECTRONICS. STRAND FOR WIRE ROPE AND BRAIDED APPLICATIONS — MANDREL WIRE — WIRE FOR FORMS — RIVETS — STAPLING

LFA
LITTLE FALLS ALLOYS Inc.
191 Caldwell Ave., Paterson 1, N. J.

News–New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation

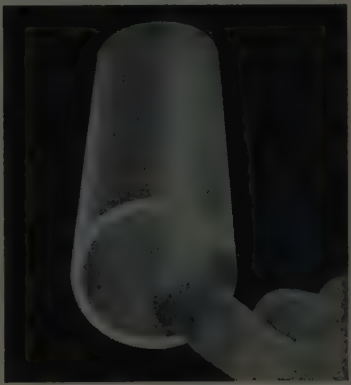
(Continued from page 140A)

and the 1N368 under inductive load are 70, 140, 210, and 140 volts. The dc output currents are respectively 150, 100, 75, and 100 ma and peak inverse ac voltages 100, 200, 300 and 200 volts.

New Welded Tubing Process

A new welding process has been developed and patented to manufacture welded stainless steel and high alloy pipe and tubing.

U. S. Patent No. 2,716,692 issued to **Trent Tube Co.,** East Troy, Wis., a wholly owned subsidiary of **Crucible Steel Company of America,** will revolutionize the method of manufacturing welded tubing and pipe, the firm claims. Improvements noted in the new tubing give it better physical properties, appearance and corrosion resistance, which will increase its potential uses. Trent has been experimenting for years to reduce or eliminate the weld bead on the inside diameter of the tubing after welding.



The TRENTWELD method of forming stainless and high alloy tubing and pipe utilizes the inert-gas shielded-arc process, an adaptation of the procedure developed by Hobart and Devers of General Electric Company in 1930. Heat is generated by an arc struck between a non-consumable tungsten electrode and the work. This arc occurs entirely in a shielded atmosphere of inert gas, such as helium or argon, while the arc length is automatically maintained. No additional metal is required in this welding process; the weld in a complete fusion of the butted edges of the strip. This manufacturing

(Continued on page 144A)

NOW FOR DC OR RESISTANCE INPUT

MODEL 200-A uses an input of 10,000 ohm resistance potentiometers as an input transducer providing 10 to 1 scale expansion and origin positioning. Available standard digital input accessories are essentially inputs of this type. Any resistance potentiometer will provide an analog input for this configuration.

MODEL 200-B, used for D.C. signal input, has full scale sensitivities of 5 millivolts and an input impedance of 1,000 megohms. Utilizing standard reference cells, this model provides drift-free operation. Available external reference voltages may be substituted. A plug connection is provided to facilitate the quick interchangeability of input sections.

NOW FOR SIMPLIFIED OPERATION

Precision Vernier Dials provide an accurate method for obtaining fine adjustment during operation. Optional point plot or continuous line plotting is a feature of both models. Selection is by front panel manual control. A new, simplified pen of one-piece design-used for point or continuous plotting—eliminates bottles and tubes, permits rapid changing of ink colors. Independent action of the X and Y axis is achieved with Librascope's unique "Floating Gear Train." No cables, tapes or lead screws to cause lost motion, cable stretching or drifting out of alignment. The 120° concave cylindrical plotting surface provides full visibility . . . is completely illuminated.

NOW FOR WIDER APPLICATION

These fast, dependable general purpose plotters feature 0.1% accuracy, are suited for wide applications where rapid graphic presentation of data is required, such as: laboratory testing, computers, data handling systems, wind tunnel, missile tracking and quality control testing of transistors and other electronic components. Input selection includes Punched Card and Tape Converters, Decimal Keyboards and Binary Converters. Model 200-A can plot from Flexowriter tape in any code or directly from the Tape Punch cables of many digital computers. Subchassis can be supplied to handle time-shared X versus Y plots, or other special circuitry. Write today for details.

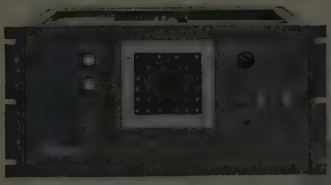
LIBRASCOPE X-Y PLOTTER

HIGHEST ACCURACY FOR GRAPHIC DATA HANDLING

LIBRASCOPE

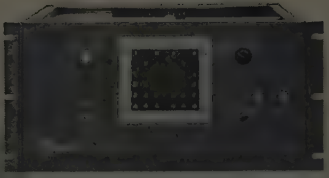
A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

Greater input flexibility | For desk or rack mounting



NEW LIBRASCOPE PUNCHED TAPE CONVERTER
Operates from a punched tape reader—Specially designed for Librascope X-Y Plotters—This unit is adaptable to other plotters.

LIBRASCOPE X-Y DECIMAL KEYBOARD
Consists of three-decimal bank for each axis with associated plus minus keys. Features Librascope designed positive-action self-wiping contacts.



LIBRASCOPE PUNCHED CARD CONVERTER
Converts punched card data to analog form for input to X-Y Plotters. Automatic Position for feeding 50 punched cards per minute.

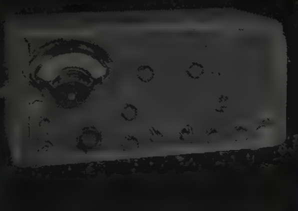
LIBRASCOPE INCORPORATED • 808 WESTERN AVENUE • GLENDALE, CALIFORNIA

UHF

ULTRA HIGH FREQUENCIES

*radio interference and field intensity**

MEASURING EQUIPMENT



Stoddart RI-FI* meters cover the frequency range 14kc to 1000 mc

VLF

NM-10A, 14kc to 250kc

Commercial Equivalent of AN/URM-6B. Very low frequencies.

HF

NM-20B, 150kc to 25mc

Commercial Equivalent of AN/PRM-1A. Self-contained batteries. A.C. supply optional. Includes standard broadcast band, radio range, WWV, and communications frequencies
Has BFO.

VHF

NM-30A, 20mc to 400mc

Commercial Equivalent of AN/URM-47
Frequency range includes FM and TV bands

Stoddart NM-50A

375mc to 1000mc

Commercial Equivalent of AN/URM-17

ULTRA-HIGH FREQUENCY OPERATION... Frequencies covered include UHF and color television assignments and Citizen's Band. Used by TV transmitter engineers for plotting antenna patterns, adjusting transmitters and measuring spurious radiation.

RECEIVING APPLICATIONS... Excellent for measuring local oscillator radiation, interference location, field intensity measurements for fringe reception conditions and antenna adjustment and design.

SLIDE-BACK CIRCUIT... This circuit enables the meter to measure the effect of the peak value of an interfering pulse, taking into account the shaping due to bandwidth.

QUASI-PEAK FUNCTION... An aid in measuring pulse-type interference, the Quasi-Peak function is just one of the many features of this specially designed, rugged unit, representing the ultimate in UHF radio interference-field intensity equipment.

ACCURATE CALIBRATION... Competent engineers "hand calibrate" each NM-50A unit. This data is presented in simplified chart form for easy reference.

SENSITIVITY... Published sensitivity figures are based on the use of the NM-50A with a simple dipole antenna or RF probe. However, the sensitivity of this fine instrument is limited only by the antenna used. The sensitivity of the NM-50A is better than ten microvolts across the 50 ohm input.

STODDART *aircraft radio co., inc.*
6644-C SANTA MONICA BLVD. HOLLYWOOD 38, CALIFORNIA · HOLLYWOOD 4-9294

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 142A)

process results in a weld which has the same composition as the parent metal and which is free from inclusions, oxides, or similar defects. Prior to this discovery, it was impossible to utilize consistently the potentials of welded stainless steel tubing and pipe to take advantage of its high corrosive resistance, high strength-weight-ratio, high strength at low temperatures and heat resistant properties.

In forming stainless and high alloy tubing, the continuous mill consists of a series of horizontal and vertical rolls. The flat rolled metal strip first passes through the driven forming rolls where it is gradually shaped from the flat cross section to a circular cross section. This cold forming from the flat strip to a tubular shape, in addition to exposing both sides of the uniform stock for visual inspection, magnifies any surface imperfection which might have escaped previous inspections. In addition, every mill run of tubing is subjected to severe tests to insure that the finished product will meet every specification needed for particular applications. Final inspection includes some or all of the following tests: tolerance, expansion, flanging, flattening, crush, pressure and reverse bend. In addition, the laboratory makes the necessary corrosion, tensile and metallurgical examinations.

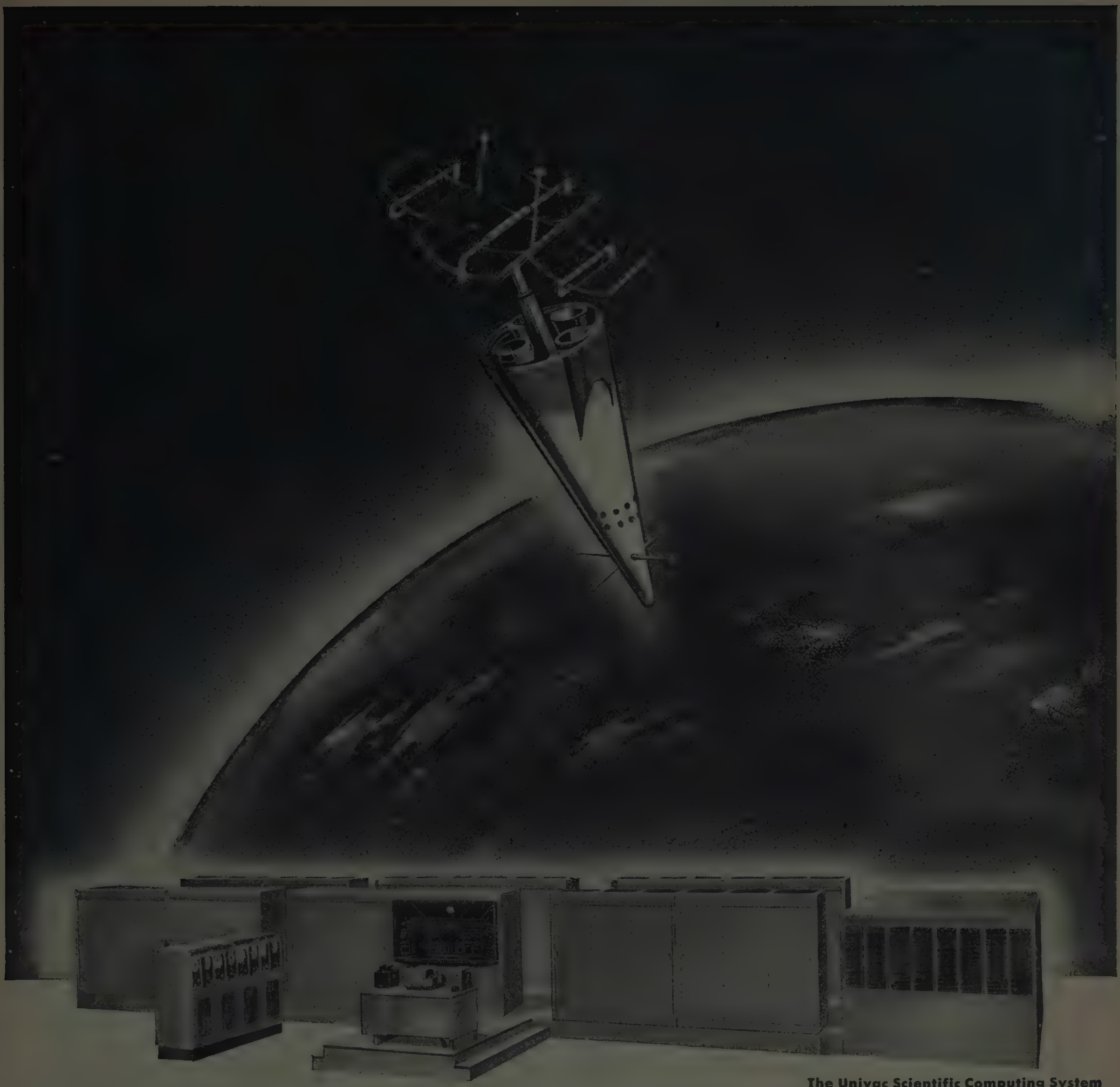
Batch Counters

The Detectron DS-700 Series Batch Counters, newest of the electronic instrument line being manufactured by the **Computer-Measurements Corp.,** 5457 Cleon Ave., North Hollywood, Calif., is now available for industrial applications requiring batch or total count.

The new DS-700 Series units are direct reading totalizing electronic counters designed for industrial batch counting, measuring characteristics of jet engines, turbines, electric motors, counting total revolutions of high speed shafts, etc.

Available in four models, the DS-700 Series is said to operate

(Continued on page 146A)



The Univac Scientific Computing System

Launching Tomorrow's Satellite

When the first man-made satellite is launched on its orbit around the earth, it will owe its existence to the thousands of missiles which have preceded it, and to the careful analysis of their patterns of flight. The Univac Scientific of Remington Rand has speeded this effort immeasurably, handling flight analyses for the nation's guided missile program.

Each missile firing, each analysis, involves enormous amounts of in-flight data, with manual computations normally requiring from 250 to 500 hours. This staggering work load is accomplished by the Univac Scientific Electronic Computer in approximately *4 to 8 minutes*.

Because of its ability to reduce large volumes of data at tremendous speeds, the Univac Scientific System easily handles even the most difficult research problems. Its speed is matched by many other outstanding characteristics, including: superb operating efficiency, obtained through large storage capacity . . . great programming versatility . . . the ability to operate simultaneously with a wide variety of input-output devices . . . and far greater reliability than any computer of its type.

For more information about the Univac Scientific System or for information about how you might apply the system to your particular problems, write on your business letterhead to . . .

ELECTRONIC COMPUTER DEPARTMENT **Remington Rand** ROOM 2166, 315 FOURTH AVE., NEW YORK 10
DIVISION OF SPERRY RAND CORPORATION

STANDARD TELETYPEWRITERS AND RECTIFIERS

A wide range of standard teletypewriters and accessories are available for early delivery from current production. These machines are assembled from parts produced by a leading American manufacturer and are standard and interchangeable in every way. They can be supplied in either commercial or military packing, with instruction books. All units carry a 12-months' guarantee. We stock spare parts.

The following types of teletypewriters are available:

- Model 15 Page Printer.
- Model 19 Page Printer.
- Model 14 Tape Printer.
- Model 14 Typing Reperforator
- Model 14 Transmitter-Distributor.
- Type TG-7A or TG-7B Teletypewriter (U.S. Signal Corps version of Model 15)
- Type TG-26 Teletypewriter (U.S. Signal Corps Typing Reperforator Transmitter-Distributor Set).
- Type TT-7 Teletypewriter (U.S. Signal Corps version of Model 19)

Teletypewriters can be supplied in the following optional arrangements:

- Send and receive or receive only.
- 50 or 60 cycle synchronous or governed, or d-c governed motors.
- Holding or pulling-magnet selectors.
- Line relay and relay bracket optional.
- Tables optional.
- Rectifiers optional.
- Any standard keyboard and type-pallet arrangement.
- Any standard arrangement of functions.

Rectifiers: Input 115v 50-60 cycles A.C. Output 115 volts D.C.

Regulated

Type	D-C Amps.
REC-13	0.6
F3901	0.8
RA43	4.5

Non-Regulated

Type	D-C Amps.
F11360	0.2
REC-4	0.25
RA-87	0.4
F8387	0.6
KS5988	0.8

RADIO ENGINEERING PRODUCTS
1080 UNIVERSITY STREET, MONTREAL 3, CANADA
Telephone: UNiversity 6-6887
Cable Address: Radenpro, Montreal
MANUFACTURERS OF CARRIER-TELEGRAPH, CARRIER-TELEPHONE AND BROAD-BAND RADIO SYSTEMS

Electrically Conductive Cloth

A New Engineering Material for Many Applications in Electronics

SUGGESTED USES:
RF SHIELDING
RADAR REFLECTION
MICROWAVE GASKETING
WARNING SYSTEMS
ATTENUATORS
STATIC DISCHARGE

Buy it by the yard and sew it to shape on any sewing machine. Or, have us sew it for you.

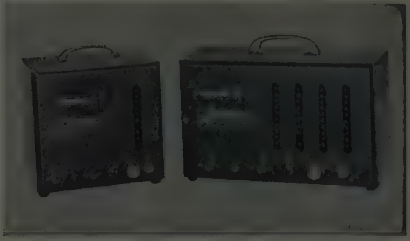
WRITE OR PHONE
Swift
INDUSTRIES, INC.
10 Love Lane, Hartford 1, Conn.
Hartford 2-1181

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 144A)

with absolute accuracy from 0 to 100,000 counts per second, depending on the number of decades. A mechanical register extends



the maximum count capacity to 9,999,999,999 on Model DS-740, the 4 decade unit. Count capacity on the smaller DS-710 is 9,999,999. Relay contact closure and negative output pulse of approximately 100 volts is provided each time the electronic decade section reaches maximum count. Relay contacts are rated at 5 amperes, 115 volts, 60 cps. Complete specifications are available on request to the company.

Insulation Effective to 1000°F

A new "ceramoplastic" electrical insulation material that can withstand the effects of radiation and 1000°F temperatures without losing its properties has been developed by the **Mycalex Corp. of America,** Clifton Blvd. Clifton, N. J.

MYCALEX 410
1100° F.

The new material, called Supramica* ceramoplastic, consists of pulverized synthetic mica bonded with high-grade electrical glass. The performance of Supramica at high temperatures is due to the use of synthetic mica rather than natural mica. Previous formulations of mica and glass, made with natural mica, were unable to maintain their mechanical properties at temperatures above 700°F.

In addition to high thermal and radiation endurance, Supramica ceramoplastic products are claimed

* Reg. TM

(Continued on page 148A)

International Rectifier

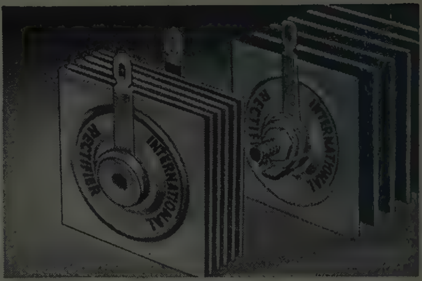
Selenium and Germanium Rectifiers

International Selenium Products

Pressed powder or vacuum process used as determined by our Applications Engineering Dept. The most widely used Industrial Power Rectifiers in Industry today!

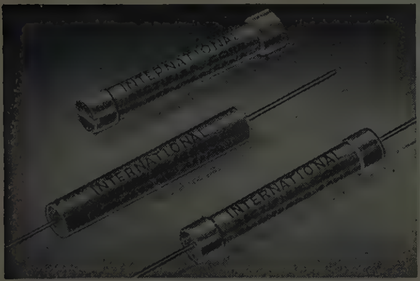
INDUSTRIAL POWER RECTIFIERS

For all DC power needs from microwatts to kilowatts. Features: long life; compact, light weight and low initial cost. Ratings: to 250 KW, 50 ma to 2,300 amperes and up. 6 volts to 30,000 volts and up. Efficiency to 87%. Power factor to 95%. **Bulletin C-349**



TV AND RADIO RECTIFIERS

The widest range in the industry! Designed for Radio, Television, TV booster, UHF converter and experimental applications. Input ratings from 25 to 195 volts AC and up. DC output current 10 to 1,200 MA. Write for application information. **Bulletin ER-178-A**



HIGH VOLTAGE CARTRIDGE RECTIFIERS

Designed for long life and reliability in Half-Wave, Voltage Doubler, Bridge, Center-Tap Circuits, and 3-Phase Circuit Types. Phenolic Cartridge and Hermetically Sealed types available. Operating temperature range: −65°C to +100°C. Specify **Bulletin H-2**

SUB-MINIATURE SELENIUM DIODES

Developed for use in limited space at ambient temperatures ranging from −50°C to +100°C. Encapsulated to resist adverse environmental conditions. Output voltages from 20 to 160 volts; output currents of 100 microamperes to 11 MA. **Bulletin SD-1B**

INTERNATIONAL RECTIFIER CORP.
EL SEGUNDO CALIF.

PHOTOELECTRIC CELLS

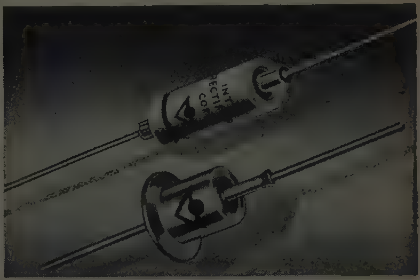
Self-generating photocells available in standard or custom sizes, mounted or unmounted. Optimum load resistance range: 10 to 10,000 ohms. Output from .2 MA to 60 MA in ave. sunlight. Ambient temperature range: −65°C to +100°C. **Bulletin PC 649**

International Germanium Products

High quality units of improved design are the results of years of experience in the production of exceptionally fine germanium crystals plus extensive research, development and field performance testing!

GERMANIUM POWER RECTIFIERS

This new line features: High efficiency—up to 97%, Lowest forward drop, High reverse to forward current ratio, unlimited life expectancy. No reforming required after storage. Ratings: 26 to 66 AC input v. per junction: 150 to 100,000 amps DC output. Operating temperature range: −55°C to +75°C. In three styles. **Bulletin GPR-1**



GERMANIUM DIODES

POINT CONTACT. High quality crystals—long reliable life—superior resistance to humidity, shock, temp.-cycling. **Bulletin GD-2**
JUNCTION POWER. Hermetically sealed—welded construction. Available in Standard JETEC 1N91, 1N92, 1N93 types. For diodes to meet your specific requirements, consult our Semiconductor Division.

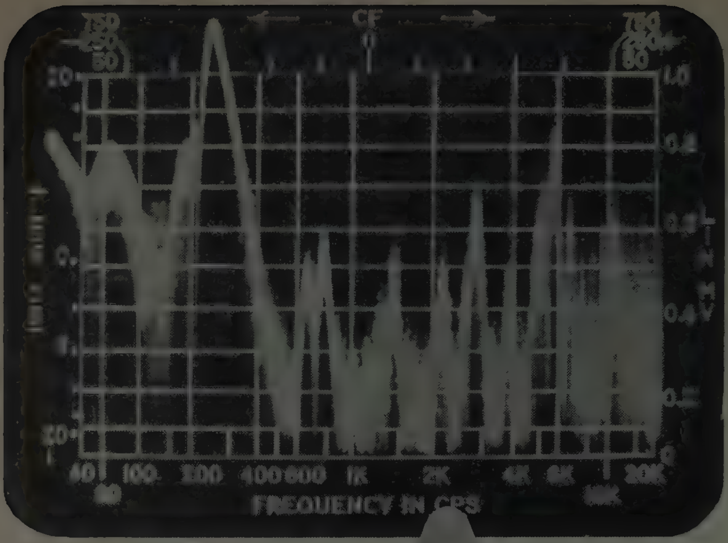
a world of difference through research!

For bulletins on products described **WRITE ON YOUR LETTERHEAD** to our **PRODUCT INFORMATION DEPARTMENT**

International Rectifier
CORPORATION

EXECUTIVE OFFICES: 1521 E. GRAND AVE., EL SEGUNDO, CALIFORNIA • PHONE OREGON 8-6281

WORLD'S LARGEST SUPPLIER OF INDUSTRIAL METALLIC RECTIFIERS



Analysis of vibration resonances of a small motor. Actual analysis time 10 seconds.

how to accurately analyze
SOUNDS, VIBRATIONS, AUDIO WAVEFORMS
at high speeds (as much as 360 times faster, in fact)
-with-
PANORAMIC
Sonic Analyzer
LP-1

Model LP-1 showing edge-lit reticule and camera mount bezel.

Whatever your problem . . . sound, vibration, or general spectrum analysis in the laboratory or on the production line, you can reduce engineering and production test costs with the Panoramic Sonic Analyzer LP-1.
In only one second, the LP-1 automatically visualizes on a Cathode Ray Tube the frequency and magnitude of waveform components between 40 and 20,000 cps.
Join the many top-flight manufacturing, research and development activities which have increased their efficiency through the use of instruments made by Panoramic, the leader.

● Operates with microphones, vibration pickups and other transducers. ● Presents data graphically permitting rapid, direct readings of frequency and voltage. ● Data can be easily photographed or recorded. ● Linear and log voltage calibrations. ● Simple operation.

Fairchild Polaroid Oscilloscope Camera Model F-296

Designed for use with Panoramic instruments incorporating a 5″ flat face CRT, Model F-296 provides full size prints of panoramic presentations. No photographic skill required.

the pioneer is the leader

PANORAMIC
RADIO PRODUCTS, INC.

WRITE FOR COMPLETE DETAILS, PRICES AND DELIVERY TODAY

12 South Second Ave., Mount Vernon, N.Y. Phone: MOunt Vernon 4-3970

News–New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 146A)

to provide total and permanent dimensional stability, low electrical loss, and unequalled arc resistance. They are also impervious to water, oil, and organic solvents.

The new material is now available in sheet and rod form (Supramica 500) with a thermal endurance of 1000°F or as finished components precision-molded to desired specifications (Supramica 555), with a 950°F. thermal endurance. Use of Supramica 500 ceramoplastic (the fabricating grade) with fired silver paste printed circuits greatly extends the application range of printed circuitry techniques under critical conditions.

Multi-Function Supply

It was announced by **Industrial Engineering Corp.**, 525 E. Woodbine, Louisville 8, Ky., designer and manufacturer of advanced-type testing and control apparatus, that the company has reached production stage on its new multi-power source stand for the aircraft industries.

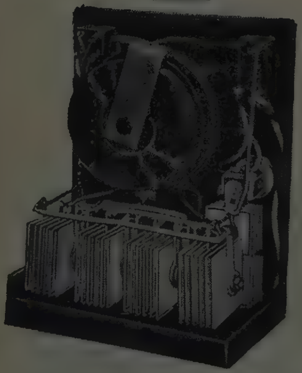
Industrial Engineering's multi-power source stand can simulate any combination of aircraft electrical conditions. A completely packaged unit, it is designed to provide the following types of power: (1) variable voltage dc from 5 to 32 volts with 200 amperes maximum; (2) variable voltage 60 cps from 0 to 135 volts with 20 amperes maximum; (3) variable voltage from 95 to 135 volts with

(Continued on page 150A)

Original equipment for over seven years!

Radio Receptor Selenium Rectifiers

....Deliver Top Performance in Variac Motor Speed Controls



One of General Radio's Variac Motor Speed Controls showing a typical application of Radio Receptor Selenium Rectifiers. Six RRco. units are employed here.

Back in 1948, General Radio Co. of Cambridge, Mass. posed tough rectification problems to us involving their compact new Variac Motor Speed Controls. Working closely with their engineers then and since we have come up with the answers. As a result, Radio Receptor rectifiers have successfully been used in units rated at 1/15, 1/6 and 1/3 hp for field and armature supplies.

General Radio tells us that year after year *for seven years* the service record of these Radio Receptor rectifiers has proved they are worthy components of a fine product—that they are long lived and really reliable in constant use in many diversified applications.

You see, it pays to talk to Radio Receptor specialists when the circuit calls for rectifiers. We'll gladly offer practical suggestions concerning *your* problem, too. Write us now!

652
432
+
500 MA

Semiconductor Division
RADIO RECEPTOR COMPANY, INC.
In Radio and Electronics Since 1922
Sales Offices: 251 West 19th Street, New York 11, N. Y., WAtkins 4-3633 • Factories in Brooklyn, N. Y.

RADIO RECEPTOR PRODUCTS FOR INDUSTRY AND GOVERNMENT: SELENIUM RECTIFIERS • GERMANIUM AND SILICON DIODES
THERMATRON DIELECTRIC HEATING GENERATORS AND PRESSES • COMMUNICATIONS, RADAR AND NAVIGATION EQUIPMENT

YOKE SPECIALISTS

- Military or special yokes and focus coils designed to your specifications.
- Production yokes for TV sets.

For your answer to yoke problems write Dr. Henry Marcy today.

syntronic
INSTRUMENTS, INC.
100 Industrial Road • Addison, Ill. • Phone: Terrace 4-6103

the ONLY instrument in the field that offers ALL these features at

NO EXTRA COST!

- FREQUENCY Measurement
- 1 and 10 SECOND Time Base
- PERIOD Measurement
- 1 and 10 CYCLE Gate Time
- PRECISION ACCURACY Over 1-100,000 cps range
- EASILY PORTABLE Only 28 Pounds
- SMALL SIZE 14¼"W x 7½"H x 13½"D

the new
DS-6100-T FREQUENCY-PERIOD electronic counter

A compact frequency-period counter designed for direct measurement of any mechanical, electrical or optical phenomena which can be converted to a varying voltage. Read-out in direct digital form. Ideal for use by skilled or unskilled personnel. Price $700.00.

Write for complete catalog data TODAY!

BOOTH 434
AUTOMATION SHOW
CHICAGO—NAVY PIER

Representatives in all major areas.
Detectron Trade Mark
COMPUTER-MEASUREMENT CORP.
Dept. 86-N, 5457 Cleon Ave.,
North Hollywood, Calif.

D-111

News New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

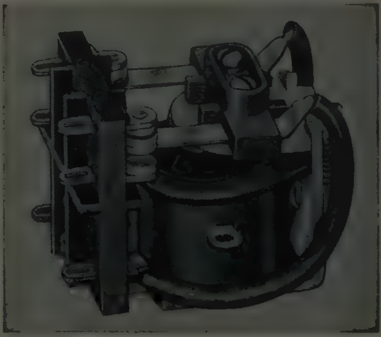
(Continued from page 148A)

variable frequency from 380 to 420 cps.

Among many anticipated applications will be its use in checking aircraft relays, solenoid valves, aircraft radio and radar receivers and transmitters. It is ideally suited for short runs and for overhaul and modification purposes. Optional caster mounting provides mobility for use in different locations.

All-Purpose Relay

The new Guardian Series 1200 ac or dc relay being currently produced by **Guardian Electric Manufacturing Co.,** Dept. 1200, 1621 W. Walnut St., Chicago 12, Ill., is rated up to 8 amperes, at 115 volt, 60 cps, non-inductive load. Overall dimensions: 1 11/15 long, 1 wide. 1¼ inches high, and the relay weighs 1.9 ounces. Contact combinations are available up to three-pole, double-throw. Solder terminals are molded in a phenolic block, with barriers for over-surface insulation to meet Underwriters' Laboratories specifications.



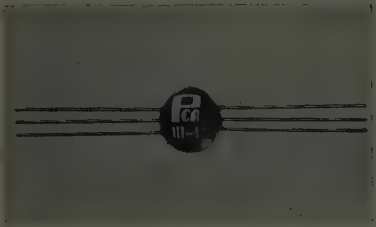
The manufacturer states that the Series 1200 relay has already become standardized for applications such as automation, computers, communications equipment, circuitory projects, remote control units, automatic selectors, electronic controls and innumerable switching devices. Unit is also available in a variety of Interlock arrangements formed with any combination of ac/ac, ac/dc and dc/dc, Series 1200 relays. For further information write to the firm.

(Continued on page 183A)

(Continued from page 150A)

Pulse Transformer

PCA Electronics Inc., 2180 Colorado Ave., Santa Monica, Calif. announces the release of new information on its MPT miniature pulse transformer. Highly miniaturized, this is available in 2, 3, and 4 windings, and a pulse width range of 0.01 to 25 micro-seconds. Other values are available to customer specifications.



As an encapsulated unit, it is commonly mounted by soldering into a circuit. Because of its small size, there are no shock or vibration problems.

The transformer meets MIL-T-27A, wherever applicable. It is

(Continued on page 186A)

RADAR
CIRCUIT
DESIGNER

- For a planned-expansion electronics program.

Engineering on airborne search and track radar systems offers an opportunity for a circuit design engineer to design and supervise circuit construction by laboratory assistants. Design emphasis is on minimum adjustments and stability in hot and cold temperature, humidity, shock, vibration, and altitude.

Circuits will require miniature and sub-miniature tubes and transistors. Knowledge of radar noise problems is necessary. Job calls for occasional travel for discussion and coordination with military engineers. Home is in beautiful upstate New York area. Salary up to $12,000.

Please send reply to:

Box 940, Institute of Radio Engineers
1 East 79th St.
New York 21, N.Y.

ENGINEERS

How Realistic Are You About Your Future In Electronics?

As the electronics industry grows from $9 billion to $20 billion in the next 10 years, will you be growing with it?

In answering, consider the extent to which your personal progress is dependent on the progress of the company you are with...and the following facts about Sylvania:

- Sylvania has expanded to 45 plants and 16 laboratories in 11 states
- In 6 years, the electronics industry grew 24%; Sylvania grew 32%
- Since 1949, Sylvania has doubled its engineering staff and tripled its sales

Sylvania's success story is the story of its creative engineers. These men of talent are given wide latitude to experiment...every facility to test original designs...and are rapidly advanced in the company as is shown by the fact that the average age of high level officials at Sylvania is only 45.

If you are realistic about your future, look into the opportunity now open to join Sylvania...and be high in your profession 10 years from now.

WALTHAM Engineering

Majors in E.E., M.E., Math, Physics. Research & Development experience in—

Countermeasures
Systems Analysis
Transistor Applications
Noise Studies
Antenna Res. & Dev.
Systems Development
Mechanical Design
Miniaturization
Digital Computer
  Circuits & Systems
Circuit Design
Shock & Vibration
Technical Writing
Missile Analysis

Missile Systems Laboratory
Radar Research & Development
Missile Guidance & Ground
  Equipment Analysis
Systems Evaluation Operations
  Research

BUFFALO Engineering

Majors in E.E., M.E., or Physics. Experience in Product Design and Advanced Development in—

Circuit Design
Systems Development
Pulse Techniques
F.M. Techniques
Equipment Specifications
Components
Microwave Applications
Servo Mechanisms
Subminiaturization
Mechanical Design
Shock & Vibration
Heat Transfer

INTERVIEW & RELOCATION EXPENSES WILL BE PAID BY SYLVANIA

Sylvania provides financial support for advanced education as well as liberal insurance, pension and medical programs

Please forward resume to: Professional Placement Supervisor

SYLVANIA ELECTRIC PRODUCTS INC.

Thomas A. Tierney
100 First St.
Waltham, Mass.

Randall A. Kenyon
175 Great Arrow Ave.
Buffalo 7, N.Y.

SYLVANIA
SYLVANIA ELECTRIC PRODUCTS INC.

Your inquiries will be answered within 2 weeks

ELECTRONIC DEVELOPMENT ENGINEERS

CHALLENGING DESIGN & DEVELOPMENT POSITIONS FOR CREATIVE ENGINEERS

These positions are tailor-made for highly imaginative engineers who enjoy problems of more than ordinary difficulty; problems that require a maximum of individual electronic creativity. Men selected will be entrusted with the complete electronic or electro-mechanical design and development tasks (initial circuits, systems, components, or product design) entailed in carrying a prototype project from original conception to its completion.

REQUIREMENTS: Senior and Intermediate engineers with degrees and 4 to 8 years' experience; Junior engineers with degrees and 1 to 3 years' experience, capable of growing with our long-range, electronic design and development program in the following fields:

(1) ANALOG COMPUTER
(2) RADAR BEACONS
(3) MAGNETIC AMPLIFIERS
(4) ELECTRO-OPTICS
(5) MISSILE SYSTEMS
(6) SERVOS
(7) FIRE CONTROL SYSTEMS

PROOF OF U. S. CITIZENSHIP REQUIRED

WE ARE LOCATED in a suburban area, at the Paramus exit of the Garden State Pkway., convenient to the N. J. Turnpike and only 15 minutes from Manhattan. If you choose, you can live nearby, avoiding the discomforts, costs and time wasted in commuting. Enjoy living in a clean, friendly community, minutes from work!

Interviews will be arranged at convenient locations. Send resume to:

AVION DIVISION
OF ACF INDUSTRIES INCORPORATED
Route 17, Paramus, N. J. COlfax 1-4100
Only 15 minutes from
George Washington Bridge

Immediate Openings at KOLLSMAN

SYSTEMS ENGINEERS . . . For development, testing and field service of airborne navigational systems. Some experience with servos utilizing electronic and electro-mechanical components desirable.

ELECTRICAL ENGINEER . . . Experience in small electro-mechanical devices, motors, synchros and induction pick-offs.

DESIGNERS
Electronic, Electro-Mechanical, Mechanical

1. Electronic and electrical packaging. Knowledge of sub-miniaturized techniques. Work is associated with servos, amplifiers and components.

2. Mechanical or electro-mechanical packaging of precision flight instruments.

These are permanent positions with Kollsman, designers of America's finest aircraft instruments . . . a progressive, growing organization in which the atmosphere is friendly, the facilities of the best, and the employee benefit program liberal.

Please submit complete resumes,
preliminary to confidential interview
to the Employment Manager.

kollsman INSTRUMENT CORPORATION
80-08 45th AVENUE, ELMHURST, NEW YORK • SUBSIDIARY OF *Standard* COIL PRODUCTS CO. INC.

Engineers

ELECTRONIC
ELECTRO-MECHANICAL

Several outstanding opportunities are now available with The Teleregister Corporation, a leading company in the field of special purpose electronic and electro-mechanical data processing and display systems for civilian purposes. Special applications include airline reservations data systems, automatic inventory control, etc.

Computer Development

PROJECT ENGINEER
SENIOR ENGINEER

Working in the development and design of electronic or electro-mechanical special purpose data handling systems.

●

COMMUNICATIONS ENGINEER

Planning overall systems of wire line communications, involving automatic teletype switching equipment.

The company is located in Southern Connecticut, in an attractive suburban community close to Long Island Sound, where living and working conditions are ideal. Less than one hour to New York.

●

Salaries, advancement opportunities and other benefits are exceptional enough to appeal to highly qualified professional men.

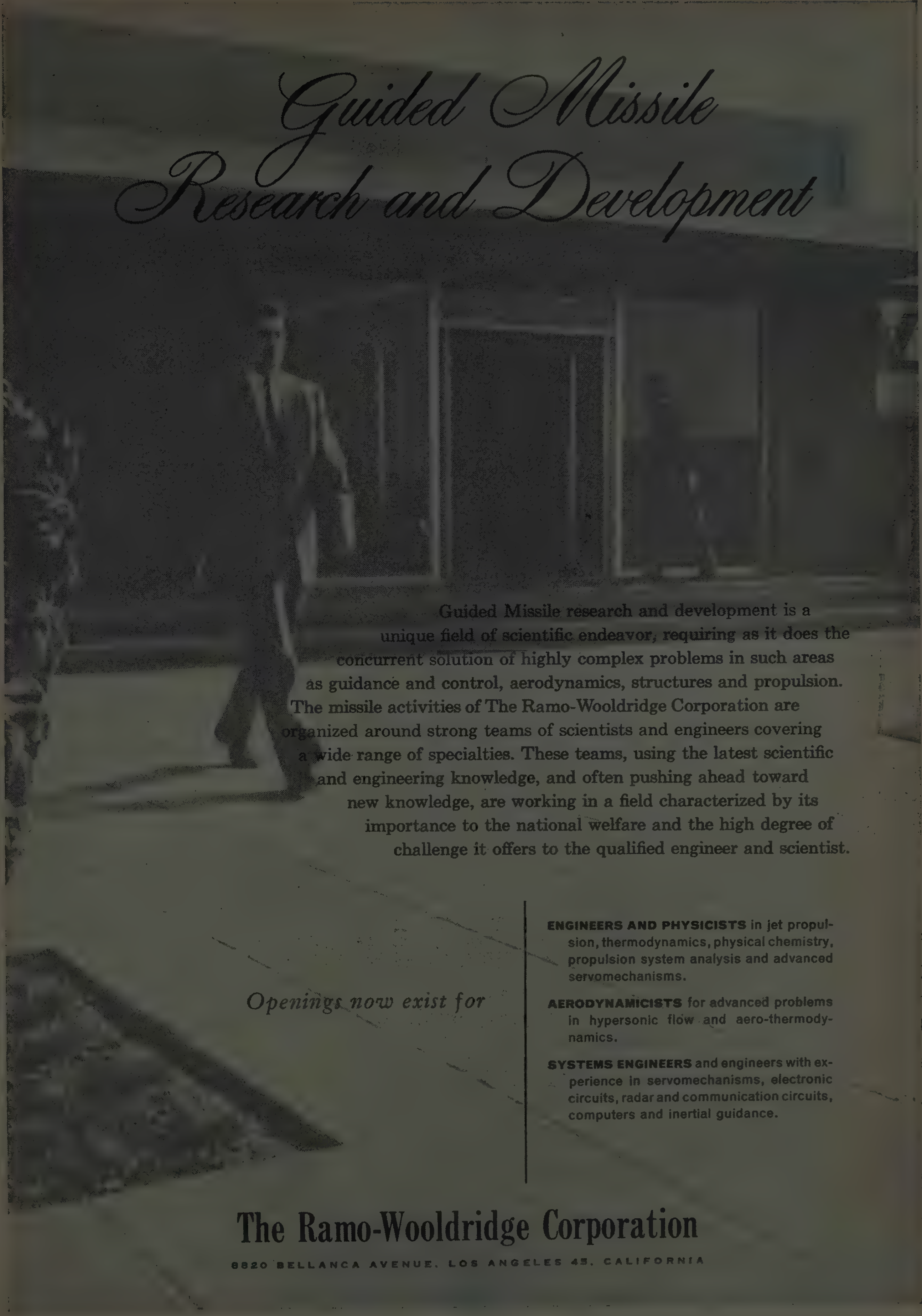
FOR FURTHER INFORMATION:

AUTOMATION EXPOSITION
Chicago • Navy Pier • November 15th-17th
Visit The Teleregister Corporation Exhibit,
or contact
Mr. Joseph Mitchell, Hotel Conrad Hilton

OR

Address inquiries, in strict confidence, to:

RICHARDSON, BELLOWS, HENRY & COMPANY, Inc.
Industrial Consultants
RBH
1 West 57th Street, New York 19, N. Y.



Guided Missile Research and Development

Guided Missile research and development is a unique field of scientific endeavor, requiring as it does the concurrent solution of highly complex problems in such areas as guidance and control, aerodynamics, structures and propulsion. The missile activities of The Ramo-Wooldridge Corporation are organized around strong teams of scientists and engineers covering a wide range of specialties. These teams, using the latest scientific and engineering knowledge, and often pushing ahead toward new knowledge, are working in a field characterized by its importance to the national welfare and the high degree of challenge it offers to the qualified engineer and scientist.

Openings now exist for

ENGINEERS AND PHYSICISTS in jet propulsion, thermodynamics, physical chemistry, propulsion system analysis and advanced servomechanisms.

AERODYNAMICISTS for advanced problems in hypersonic flow and aero-thermodynamics.

SYSTEMS ENGINEERS and engineers with experience in servomechanisms, electronic circuits, radar and communication circuits, computers and inertial guidance.

The Ramo-Wooldridge Corporation

8820 BELLANCA AVENUE, LOS ANGELES 45, CALIFORNIA

Admiral

Increases

ENGINEERING STAFF

Diversification at ADMIRAL is making itself felt in more and better engineering careers.

Real ability and originality can find new challenge and opportunity with a leader in electronic development and manufacturing.

Positions available for engineers with the following backgrounds:

★ MICROWAVE ENGINEERS

Experienced in UHF and SHF circuitry and components, with understanding of wave guides, cavities, and duplexers.

★ ELECTRONIC ENGINEERS

Junior and Senior engineers for television receiver circuit design. Experienced men also needed for V.H.F. and U.H.F. tuner work.

★ RADIO ENGINEERS

Duties involve designing household and portable radio receivers. FM and AM experience preferred.

★ MECHANICAL ENGINEERS

Electro-Mechanical designers. Assignments involve the design and layout of small mechanical devices at the development level.

★ COMMUNICATIONS ENGINEERS (MILITARY)

Applied development and design of radar and other specialized military systems.

★ AUTOMATION ENGINEERS

A special opportunity exists in the field of applying automation and printed circuit techniques in the above categories. Your imagination and engineering talents can be used in furthering this development.

Good starting salaries and working conditions with complete program of employee benefits. Opportunity for professional development with excellent facilities in Chicago area to carry on University graduate work while working full time.

• Send complete resume to Mr. Walter Wecker, Personnel Department, to get more information on these opportunities.

Admiral Corporation
3800 W. Cortland St.
Chicago 47, Illinois

News-New Products

(Continued from page 183A)

suited for: Blocking oscillators, Impedance matching and phase inversion, As wide band input and output transformers, low volatge interstage coupling, triggering and counting circuits, dc isolation, pulse shaping, many other applications.

Most designs are available for immediate shipments. Others require one to three weeks delivery.

For further information and prices, contact PCA direct.

Second Edition Crystal Diode Manual

The second edition of its Crystal Diode Manual is now being offered by **CBS-Hytron, Div. Columbia Broadcasting System, Inc.,** Danvers, Mass.

Revised and brought up to date, the new edition includes germanium and silicon diodes, glass-encased and plastic-encased. The illustrated Manual continues the down-to-earth, informative approach that made the first edition

(Continued on page 188A)

ENGINEERING WRITERS

California Location

Leading manufacturer of carrier telephone and microwave equipment has openings for writers in the Technical Publications and Public Relations Departments.

Activities in Publications Dept. involve preparation of military and commercial instructions material and descriptive booklets used for sales literature.

Public Relations position is for writer to do articles for the *Lenkurt Demodulator,* a technical magazine which goes to communications engineers throughout the world.

Both positions require a good technical background with demonstrated ability to prepare written material. Send resume to

Lenkurt Electric Co., Inc.
1105 County Road
San Carlos, Calif.

ENGINEERS

Permanent, Creative Opportunities For ELECTRICAL ENGINEERS AT

Bendix

Immediate openings for . . .

Senior Computer Engineer

At least five years experience with analog computers with control applications. A degree in electrical engineering, or math and physics required. Activity is in the field of aircraft and missile power plant controls, including gas turbine, ram jet, and rocket types. Work will be with hydra-mechanical, pneumatic and electrical components. The fuel metering research facility includes an analog computer and jet engine simulators.

Magnetic Amplifier Systems Engineer

Electrical engineer supervisory capacity on research and development of magnetic amplifier circuitry, control systems, and component design and testing, supervising other engineers and technicians.

Computer Engineer

Graduate engineer thoroughly qualified as a digital computer programmer, capable of handling engineering and production calculations, to train present personnel in preparation of data for computer applications. Set up new applications. Work with complex dynamics and control problems characteristic of the jet engine fuel system and landing gear fields.

Liquid Propellant Rocket Controls Engineer

Mechanical or electrical engineer to supervise the research and development of liquid propellant rocket controls, systems design, component design, development and testing.

The salary of these positions will be determined by your ability and experience.

Send detailed résumé listing education, engineering experience, and salary requirement to:

TECHNICAL EMPLOYMENT DEPARTMENT
BENDIX PRODUCTS DIVISION OF
BENDIX AVIATION CORPORATION
401 North Bendix Drive
South Bend 20, Indiana

We guarantee you an immediate reply—

UNIVAC

The FIRST Name In Complete Electronic Computing Systems

Is Expanding

Its Field Of Operations

New . . . Different . . . Exciting Uses for Advanced Models of UNIVAC Are Already Here . . . With Even MORE TO COME!

To Truly

Ambitious, Capable, Creative

ENGINEERS

Sperry Rand

OFFERS

OPPORTUNITIES UNLIMITED

If your educational or employment background is such that you feel yourself qualified for the following ENGINEERING and ALLIED POSITIONS in the field of ELECTRONICS—

Mechanical Engineers

. . . M.E. Degree with experience for advanced positions. Specific assignments in the development of computer packaging, case work, input-output devices and servo-mechanisms.

Electrical Engineers

. . . E.E. Degree required. A wide range of positions is open to those experienced in such fields as circuit design, pulse techniques, input-output devices and magnetic recording techniques.

Also

Many other challenging openings for

- COMPUTER PROGRAMMERS
- MATHEMATICIANS
- PHYSICISTS
- PRODUCT ANALYSTS
- ENGINEERS JUNIOR & SENIOR

Company Benefits Include

. . . Graduate Study Opportunities with Complete Tuition Refund and Valuable Retirement and Group Insurance Programs.

• For Appointment Telephone Baldwin 3-7300 •

Or Write D. A. BOWDOIN, Placement Manager

Remington Rand

ECKERT-MAUCHLY DIVISION

SPERRY RAND CORPORATION

2300 W. Allegheny Avenue
Philadelphia, Pa.

300
250
200
150
100
50
RISE ABOVE AMBIENT IN DEGREES C.
WITH JAN SHIELD
BARE TUBE
WITH IERC TS 1025 SHIELD
2
4
6
8
10
12
14
16
Patent pending

...ever SUSPECT those "normal" tube failures?

You should... because the service life of a tube you now accept as normal can be greatly extended with IERC mounting techniques. With other methods, high operating temperatures deteriorate the tube... causing those premature, so-called "normal" failures!

Graphic evidence of IERC's effective tube cooling is shown in comparison with harmful temperature increases that occur with use of JAN type shields. IERC shields are designed to meet requirements of MIL-S-9372B (USAF).

Cross-licensed with North American Aviation, Inc.

HEAT-REDUCING, VIBRATION-PROOF PERFORMANCE

IERC's complete line of miniature tube shields have proved so efficient in reducing bulb temperatures and prolonging tube life that they have become the first choice of almost every leading manufacturer of aircraft radio, missiles, radar, computers and other types of precision electronic equipment!

There is an IERC shield to choose from for every tube—subminiature, miniature, octal and power!

Write on letterhead for complete illustrated IERC brochures and name of nearest service representative, TODAY!

International electronic research corporation

177 WEST MAGNOLIA BOULEVARD BURBANK, CALIFORNIA

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 186A)

popular. It contains three parts:
1. Construction and advantages.
2. Electrical and mechanical data.
3. Selection and application.

The CBS Crystal Diode Manual, Second Edition, can be obtained free from distributors of CBS tubes and semiconductors, or by writing to CBS-Hytron, Danvers, Mass. Ask for Bulletin E-217.

Airborne Shock Mounts

A new all-metal vibration mount for airborne electronic equipment has successfully met all requirements of MIL-C-172-B, reports its manufacturer, **T. R. Finn & Co. Inc., Electronics Div.,** Hawthorne, N. J.

Known as the Finnflex all-metal mount, its basic design consists of two load carrying convex Bellville-type springs in conjunction with a circular coil spring for dampening and wire mesh pads for snubbing. Its resonant frequency is below 10 cps with a magnification factor of less than 1½ at resonance with no double resonant peaks.

In order to meet the requirements of MIL-C-172-B, the mount was subjected to repeated 15G shock loading, tested for transmissibility within MIL limits, then subjected to repeated 30G shock loading and again tested for transmissibility.

Finn, who manufactures the mount in all standard military sizes and with either short or long studs, made over 400 experimental designs in order to perfect the current design of the mount. Further information may be had by writing to the company.

(Continued on page 190A)

Its in your hands! The most valuable reference work in the world

IRE
DIRECTORY
1955
1955
IRE DIRECTORY
The Institute of Radio Engineers

- for the electronics engineer
- for buyers of component parts
- for users of electronic equipment
- for anyone who must

FIND FACTS FAST

The IRE Directory contains full information on 3000 firms manufacturing products or furnishing services in the radio-electronic field, brought up-to-date every year.

Arranged efficiently and logically, the way an engineer thinks, for simple location of any product or service—

675 specific products and services, arranged under
99 major headings in
4 great groups

- Communications
- Components
- Controls and Instruments
- Materials and Services

USE YOUR IRE DIRECTORY . . . IT'S VALUABLE

Additional copies available at $15.00 each. Please send remittance with order.

THE INSTITUTE OF RADIO ENGINEERS

1 East 79th Street, New York 21, N.Y.

PORTABLE PHONOGRAPHS · TV BOOSTERS · INDUSTRIAL and MEDICAL EQUIPMENT

When You Need Coated fabrics...

Fabric-covering problems vary with the size and shape and function of the carrying case. Here's the cue for APEX specialists! For fast-colored, durable fabrics to make your units SELL faster and LAST longer... ask men who KNOW.

It will cost you nothing to let APEX specialists consider your problems.

APEX COATED FABRICS

For 29 years "THE HOUSE of SERVICE"

APEX COATED FABRICS Co., Inc.
12-16 East 22nd St., N. Y. City 10
SPring 7-3140

PORTABLE RADIOS · SERVICEMEN'S CARRYING CASES · PORTABLE PA SYSTEMS

SOUND and PROJECTION EQUIPMENT · PORTABLE TV SETS · TEST INSTRUMENTS

SERVICING KITS · TAPE RECORDERS · ANTENNA ROTATOR · CONTROL CABLES

Molded
BLACK NYLON SCREWS and NUTS

Insulate and fasten without bushings, washers, etc.
In stock 6-32, 8-32, 10-32

NyGrip BLACK NYLON Cable Clips

Light-weight non-conducting support for wiring, tubing, etc.
In stock 1/16" to 1 1/2" dia.

Free Samples... Write

WECKESSER CO.
5269 N. Avondale Avenue • Chicago 30, Illinois

New! 1956 EDITION
the biggest... most authoritative
ELECTRONIC BUYING GUIDE

OFFICIAL REFERENCE SOURCE
Electronic supplies for research and industry. Not just listings—but complete descriptions, specifications, illustrations and prices.

DOLLAR-WISE PURCHASING
Over 100,000 items — 350 manufacturers in this industry-wide MASTER catalog. Compare specs and prices first — then buy and save.

The Radio-Electronic MASTER
OFFICIAL BUYING GUIDE OF THE INDUSTRY

1456 pages
List $7.50
As low as $2.95 from parts distributors

• 100,000 items • Complete descriptions • Specifications—Prices • 11,000 illustrations • 350 mfrs. • 8 x 11", 6 lbs.

UNITED CATALOG PUBLISHERS, INC.
110 Lafayette St., New York 13

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 188A)

Ceramic Magnets Catalog

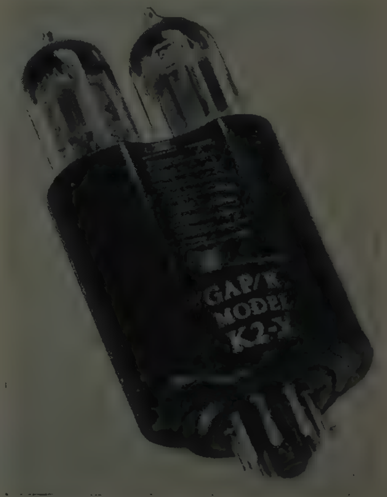
The characteristics, design and application of Index I, a lightweight, low-cost, non-metallic ceramic permanent magnet are described in a new, four-page catalog issued by the **Indiana Steel Products Co.,** Valparaiso, Ind.

Its high coercive force also makes it well adapted for generators, motors, television focusing units, polarized relays, and in applications where the magnetic length is limited or magnetization prior to assembly is necessary.

Index I contains no critical materials, such as cobalt or nickel, and has a chemical composition of $B_nF_{e12}O_{19}$. Index I magnets have a coercive force of 1,600 oersteds, a maximum energy product of 0.8×10^6 B_dH_d, and its electrical resistivity is 1×10^6 to 10×10^6 ohm cm. It weighs 0.18 pounds per cubic inch.

Operational Amplifier

A new operational amplifier, Model K2-X, has been added to the line of electronic analog components, it was recently announced by **George A. Philbrick Researches, Inc.,** 230 Congress St., Boston 10, Mass.



Using this plug-in type high gain amplifier as a base subassembly, feedback computing devices of all speeds may be assembled with simplified wiring. Featured

(Continued on page 192A)

IN COUNTING THE COUNTLESS . . .

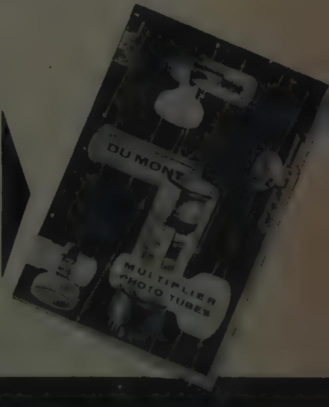
TYPE K1328
TYPE 6364
TYPE 6363
TYPE 6467
TYPE 6292
TYPE 6365

Count on Du Mont multiplier phototubes—whether you're counting stars, scintillations or holes in punched cards.

Du Mont multiplier phototubes have become a *standard for comparison.* Their superior long-term stability, their high cathode sensitivity, their excellent signal to noise ratio and their very high amplification are all well known by critical users of multiplier phototubes.

From ¾″ size used in oil-well exploration and medical research to the 16″ giants used for large area counting in astronomy and critical radiation studies, Du Mont multiplier phototubes share the same fine characteristics.

If you aren't familiar with Du Mont multiplier phototubes and want the complete story, just write on your company letterhead to:



DU MONT

Technical Sales Dept. **ALLEN B. DU MONT LABORATORIES,** Inc. 760 Bloomfield Avenue, Clifton, N. J.

for absolute reliability in

RAYDIST
ultra-sensitive
electronic
tracking systems

THE LOGICAL CHOICE WAS

This power supply, shown with the Raydist mobile electronic tracking system, is typical of the use of CHICAGO transformers in Raydist equipment.

CHICAGO the World's Toughest TRANSFORMERS

CHICAGO MIL-T-27
Sealed-in-Steel Transformer

Raydist, designed and built by the Hastings Instrument Company, Inc., of Hampton, Virginia, is a remarkably precise and sensitive electronic radio location system. Raydist systems are used for air and marine navigation tracking, marine geophysical surveying, chartmaking, meteorological studies and a host of applications requiring infinitely accurate tracking and plotting.

Because Raydist precision performance is dependent upon the quality of the components used, Hastings specifies and uses CHICAGO MIL-T-27 hermetically sealed transformers.

Wherever absolute reliability and optimum precision are essential, you'll find CHICAGO, truly the world's toughest transformers.

FREE: CHICAGO Catalog CT-554, listing over 500 Sealed-in-Steel transformers. Available from your parts distributor.

CHICAGO STANDARD TRANSFORMER CORPORATION
Addison and Elston • Chicago 18, Illinois

EXPORT SALES:
Roburn Agencies, Inc.
431 Greenwich St.
New York 13, N.Y.

News–New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 190A)

in this new unit are balanced differential inputs for minimum drift and maximum utility, high performance and economy of operation. Among the many feedback operations which can readily be performed are: addition, subtraction, integration, differentiation, proportioning, inversion, impedance, conversion and the injection of current.

The Model K2-X is a more potent version of Model K2-W, offering higher performance with comparable stability. Specifications are: Gain: 30,000 dc, open-loop; Power Requirements: 7.5 milliamperes at +300 volts dc, 5.2 milliamperes at −300 volts dc; voltage range; −100 volts dc to +100 volts for output (max); Basing: Octal plug; Height: 4½ inches overall; Weight: 3 ounces. Write for Bulletin K2-X.

(Continued on page 194A)

DISTRIBUTION AMPLIFIER

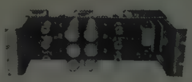
. . . for every possible video application

CHROMA-VIDEO, 4 CHAN
Wide band, excellent line
ity, 3½" chassis, 75 o
output, individual gain c
trols.

VIDEO, SINGLE CHANNE
1¾" chassis, excellent
earity, wide band, 75 o
output.

MODULAR TYPE, 5 CHAN
Gain .5 to 2, wide ba
excellent linearity, 75 o
output.

PORTABLE, SINGLE CHAN
Adjustments for varyi
gain and polarity. Inclu
power supply.

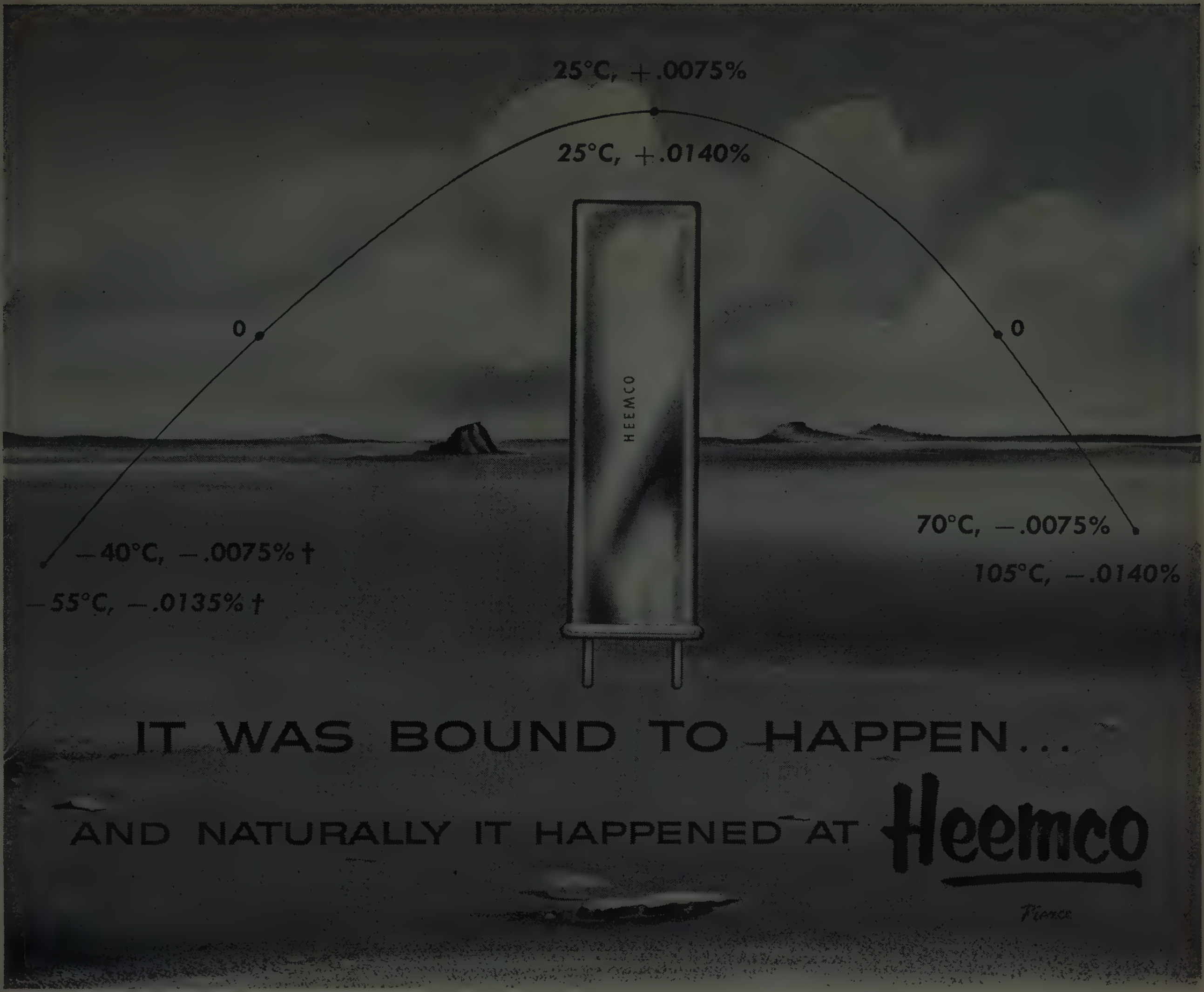


PULSE, 6 CHANNEL
Line matched output imp
ance, individual gain c
trols, excellent rise time

TARC ELECTRONICS

Modifications and special equipment engineered to your specs. For more data contact Dept. P-11.

48 URBAN AVENUE
WESTBURY, N.Y.



now in quantity production . . . ruggedized miniature, low frequency crystals* from 800 cps up for the missile temperature range of −55 to +105°C.

Heemco, a continuing leader in research, development and production of frequency control devices, is now producing in quantity a miniature 800 cps audio frequency crystal, type 5J25GS.

This unit, hermetically sealed in the standard Heemco holder, a modified MIL-HC-13/U, shows deviation in frequency of less than ±0.010% over the temperature range of −40° to +70°C or, less than ±0.025% over a range of −55° to +105°C. When used with Heemco Ovens, stabilities as close as ±.0001% can be achieved.

This rugged unit will more than meet the vibration and shock requirement MIL-C-3098A. In fact, bumper and guard arrangements cushion the effects of drops up to 36 inches.

Many of these same specifications apply for Heemco crystals from 400 cps and up, covering any frequency range that you may require. Physical size becomes even smaller above 1750 cps.

Orders for any quantity are accepted for schedules as required. Deliveries can be made in three weeks or sooner.

WRITE OR WIRE FOR TECHNICAL BULLETIN J-3

Heemco competitively priced products being used by the largest electronic equipment manufacturers in the United States and Canada include: quartz crystals for oscillators, discriminators and filters, packaged transistor or vacuum tube oscillators from 50 cps up, packaged filters of crystal or standard LC type, miniature frequency sources from 50 cps up.

**Illustrated here at actual size. Scale: 1″ = 1″*

†Actual figures for two temperature ranges.

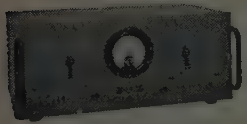
HILL ELECTRONIC ENGINEERING AND MANUFACTURING COMPANY, INC.

New Kingstown, Pennsylvania

when there's
NO margin for
ERROR-

you can rely on ARC Test Equipment!

Type H-14 Signal Generator


Type H-16 Standard Course Checker

Unerring precision is yours in the ARC Type H-14 Signal Generator! For either pre-flight or bench checks, this instrument tests *all* ARC Omni and Localizer Receivers with vital accuracy and speed. The H-14 clears one unit or a complete squadron . . . in under sixty seconds!

Checking up to 24 omni courses, to-from and flag-alarm operation, omni course sensitivity, calibration accuracy and left-center-right on localizer, the versatile H-14 also may be used to transmit voice instructions to pilots along with test signals.

ARC supplies the watchdog H-16 Standard Course Checker for *exact* course accuracy and phase measurement checks on the H-14, or any other omni signal generator. Both instruments available from factory only. Write for literature.

Dependable Airborne Electronic Equipment Since 1928

Aircraft Radio Corporation

BOONTON, NEW JERSEY

ARC

Omni Receivers • 900-2100 Mc Signal Generators • UHF and VHF Receivers and Transmitters • 8-Watt Audio Amplifiers • 10-Channel Isolation Amplifiers • LF Receivers and Loop Direction Finders

News-New Products

These manufacturers have invited PROCEEDINGS readers to write for literature and further technical information. Please mention your IRE affiliation.

(Continued from page 192A)

ESC Corp. Appoints Yard

ESC Corp., 534 Bergen Blvd., Palisades Park, N. J., announces the appointment of Broderick Yard as Project Engineer.

Previous to his new appointment at ESC, Yard was, associated with Federal Telecommunications Laboratories as Development Engineer.

Yard's experience in design-development will be put to good advantage in ESC's custom-design division. His responsibilities at ESC will include the designing of custom-built delay lines and necessary components.

DC Transformer

A small, light weight, transistorized dc transformer is announced by the **Nader Mfg. Co.**, 2661 S. Myrtle Ave., Monrovia, Calif. The unit is completely static.

The unit handles an input of 24 to 30 volts dc and will produce any dc output. Occupying 10 cubic inches which is $\frac{1}{4}$ the volume of rotary equipment, the unit is suited for miniaturization applications.

Operating principle involves the conversion of dc to a square-wave ac signal. This is stepped up or down in a transformer and then rectified to give dc output. Normal

(Continued on page 196A)

Illin U Library

volume 43 number 11

november 1955

the
institute
of
radio
engineers

PART II

Proceedings of the IRE

INDEX
TO
ABSTRACTS
AND
REFERENCES
1946–1953

reference to all Abstracts and References
monthly in THE PROCEEDINGS OF THE IRE from
ugh 1953. Reprinted from the indices
yearly by Wireless Engineer, London, England.

Part II

PROCEEDINGS OF THE IRE

Published Monthly by

The Institute of Radio Engineers, Inc.

VOLUME 43 *November, 1955* NUMBER 11

Contents

Page

Cross Reference to Abstracts Published in PROCEEDINGS II
Abbreviations Used in the Index II

SECTION I—1946
Author Index 3
Subject Index 13

SECTION II—1947
Author Index 22
Subject Index 35

SECTION III—1948
Author Index 46
Subject Index 57
List of Journals 65

SECTION IV—1949
Author Index 68
Subject Index 80
List of Journals 89

SECTION V—1950
Author Index 92
Subject Index 103
List of Journals 111

SECTION VI—1951
Author Index 114
Subject Index 127
List of Journals 135

SECTION VII—1952
Author Index 138
Subject Index 152
List of Journals 161

SECTION VIII—1953
Author Index 164
Subject Index 179
List of Journals 188

PROCEEDINGS OF THE IRE, November, 1955, Vol. 43, No. 11, Part II. Published by the Institute of Radio Engineers, Inc., at 1 East 79 Street, New York 21, N. Y. Price per copy: IRE members $1.00; non-members $2.25. Entered as second class matter, October 26, 1927, at the post office at Menasha, Wisconsin, under the act of March 3, 1879. Acceptance for mailing at a special rate of postage is provided for in the act of February 28, 1925, embodied in Paragraph 4, Section 412, P. L. and R., authorized October 26, 1927.

Copyright, 1955, by

The Institute of Radio Engineers, Inc.

BOARD OF DIRECTORS, 1955
J. D. Ryder, *President*
Franz Tank, *Vice-President*
W. R. G. Baker, *Treasurer*
Haraden Pratt, *Secretary*
John R. Pierce, *Editor*
J. W. McRae, *Senior Past President*
W. R. Hewlett, *Junior Past President*

1955
S. L. Bailey
A. N. Goldsmith
A. V. Loughren
C. J. Marshall (R5)
L. E. Packard (R1)
J. M. Pettit (R7)
B. E. Shackelford
C. H. Vollum
H. W. Wells (R3)

1955–1956
E. M. Boone (R4)
J. N. Dyer (R2)
J. T. Henderson (R8)
A. G. Jensen
George Rappaport
D. J. Tucker (R6)

1955–1957
J. F. Byrne
Ernst Weber

•

George W. Bailey
Executive Secretary

•

John B. Buckley, *Chief Accountant*
Laurence G. Cumming, *Technical Secretary*
Evelyn Davis, *Assistant to the Executive Secretary*
Emily Sirjane, *Office Manager*

EDITORIAL DEPARTMENT
Alfred N. Goldsmith, *Editor Emeritus*
John R. Pierce, *Editor*
E. K. Gannett, *Managing Editor*
Marita D. Sands, *Production Manager*

ADVERTISING DEPARTMENT
William C. Copp, *Advertising Manager*
Lillian Petranek, *Assistant Advertising Manager*

EDITORIAL BOARD
John R. Pierce, *Chairman*
D. G. Fink
E. K. Gannett
T. A. Hunter
W. R. Hewlett
J. A. Stratton
W. N. Tuttle

Responsibility for the contents of papers published in the PROCEEDINGS of the IRE rests upon the authors. Statements made in papers are not binding on the IRE or its members.

Change of address (with 15 days advance notice) and letters regarding subscriptions and payments should be mailed to the Secretary of the IRE, 1 East 79 Street, New York 21, N. Y.

All rights of publication, including foreign language translations are reserved by the IRE. Abstracts of papers with mention of their source may be printed. Requests for republication should be addressed to The Institute

Cross-Reference to Abstracts Published in Proceedings

With Errata to Abstract Numbers*

Index Year	Abstract Numbers	Issue of Proceedings	Pages
1946	1–1143	(Not published in Proceedings)	
	1144–1421	June	407– 420
	1422–1743	July	507– 524
	1744–2110	August	603– 620
	2111–2446	September	707– 723
	2447–2789*	October	808– 824
	2791–3156	November	912– 928
	3157–3508	December	1010–1024
	3509–3839	January 1947	90– 104

* Abstract No. 2790 did not appear in Proceedings.

Index Year	Abstract Numbers	Issue of Proceedings	Pages
1947	1– 326	February	219– 232
	327– 610	March	322– 336
	611– 984	April	426– 440
	985–1303	May	532– 544
	1304–1654	June	627– 640
	1655–1973	July	739– 752
	1974–2305	August	843– 856
	2306–2653	September	987–1000
	2654–3000	October	1163–1176
	3001–3385	November	1387–1400
	3386–3746	December	1587–1600
	3747–4104	January 1948	163– 176

Index Year	Abstract Numbers	Issue of Proceedings	Pages
1948	1– 320	February	291– 304
	321– 626	March	427– 440
	627– 907	April	555– 568
	908–1222	May	683– 696
	1223–1530	June	811– 824
	1531–1844	July	939– 952
	1845–2117	August	1051–1064
	2118–2429	September	1179–1192
	2430–2683*	October	1307–1320
	2684–2996	November	1435–1448
	2997–3285	December	1544–1556
	3286–3576	January 1949	99– 122

* Abstract No. 2680 did not appear in Proceedings.
Abstract Nos. 2681–2683 refer to Nos. 2680–2682 in Proceedings.

Index Year	Abstract Numbers	Issue of Proceedings	Pages
1949	1– 272	February	212– 224
	273– 601*	March	323– 336
	602– 923	April	452– 464
	924–1250	May	579– 592
	1251–1562	June	707– 720
	1563–1838	July	836– 848
	1839–2113	August	964– 976
	2114–2414	September	1091–1104
	2415–2682	October	1220–1232
	2683–2994	November	1347–1360
	2995–3318	December	1483–1496
	3319–3604	January 1950	100– 112

* Abstract Nos. 598–601 refer to Nos. 599–602 in March Proceedings.
Abstract No. 602 refers to No. 602 in April Proceedings.
Proceedings No. 598 is not listed in index.

Index Year	Abstract Numbers	Issue of Proceedings	Pages
1950	1– 268*	February	212– 224
	269– 520	March	323– 336
	521– 795	April	451– 464
	796–1046†	May	579– 592
	1047–1318	June	707– 720
	1319–1559	July	835– 848
	1560–1837‡	August	963– 976
	1838–2111	September	1107–1120
	2112–2394	October	1235–1248
	2395–2681	November	1363–1376
	2682–2954	December	1468–1480
	2955–3221	January 1951	99– 112

* Abstract No. 268 refers to No. 269 in February Proceedings.
Abstract No. 269 refers to No. 269 in March Proceedings.
Proceedings No. 268 is not listed in index.
† Abstract No. 1046 refers to No. 1047 in May Proceedings.
Abstract Nos. 1047–1048 refer to Nos. 1047–1048 in June Proceedings.
May Proceedings Nos. 1046 and 1048 are not listed in index.
‡ Abstract No. 1837 refers to No. 1836 in Proceedings.
Abstract No. 1836 did not appear in Proceedings.

Index Year	Abstract Numbers	Issue of Proceedings	Pages
1951	1– 266	February	212– 224
	267– 512	March	324– 336
	513– 794	April	451– 464
	795–1041	May	580– 592
	1042–1288*	June	724– 736
	1290–1540	July	852– 864
	1541–1810	August	989– 992
	1811–2081	September	1108–1120
	2082–2308	October	1348–1360
	2309–2607	November	1475–1488
	2608–2884	December	1581–1594
	2885–3191	January 1952	115– 128

* Abstract No. 1289 did not appear in Proceedings.

Index Year	Abstract Numbers	Issue of Proceedings	Pages
1952	1– 292	February	243– 256
	293– 561	March	372– 384
	562– 881	April	497– 512
	882–1178	May	627– 640
	1179–1486	June	754– 768
	1487–1796	July	883– 896
	1797–2098	August	1010–1024
	2099–2405	September	1139–1152
	2406–2674	October	1267–1280
	2675–2961	November	1619–1632
	2962–3297	December	1743–1758
	3298–3623	January 1953	178– 192

Index Year	Abstract Numbers	Issue of Proceedings	Pages
1953	1– 301	February	307– 320
	302– 598*	March	434– 448
	599– 909	April	561– 576
	910–1217	May	690– 704
	1218–1548	June	818– 832
	1549–1873	July	946– 960
	1874–2194	August	1074–1088
	2195–2530	September	1202–1216
	2531–2854	October	1554–1568
	2855–3163	November	1683–1696
	3164–3460	December	1805–1818
	3461–3765	January 1954	369– 382

* Abstract Nos. 589–598 refer to Nos. 594–603 in March Proceedings.
Abstract Nos. 599–603 refer to Nos. 599–603 in April Proceedings.
Proceedings Nos. 589–593 are not listed in index.

Abbreviations used in the Index

a.c. =alternating current
d.c. =direct current
h.v. =high voltage
l.v. =low voltage
a.f. =audio frequency
i.f. =intermediate frequency
r.f. =radio frequency including:—
l.f. =low frequency, <300 kc/s
m.f. =medium frequency, 300–3000 kc/s
h.f. =high frequency, 3–30 Mc/s
v.h.f. =very high frequency, 30–300 Mc/s
u.h.f. =ultra high frequency, >300 Mc/s
a.m. =amplitude modulation
f.m. =frequency modulation
p.m. =pulse modulation, including:—
p.a.m. =pulse amplitude modulation
p.c.m. =pulse code modulation

p.f.m. =pulse frequency modulation
p.ph.m. =pulse phase modulation
or
p.p.m. =pulse position modulation
p.w.m. =pulse width modulation
ph.m. =phase modulation
v.m. =velocity modulation
c.w. =continuous wave
i.c.w.
m.c.w. } =modulated c.w.
s.w.* =short wave
u.s.w.* =ultra short wave
λ =wavelength
c.r. =cathode ray
c.r.o. =cathode ray oscilloscope
d.f. =direction finding

e.m. =electromagnetic, *but*
e.m.f. =electromotive force
e.s. =electrostatic
a.f.c. =automatic frequency control
a.g.c. =automatic gain control
a.ph.c. =automatic phase control
a.v.c. =automatic volume control
m.u.f. =maximum usable frequency
p.p.i. =plan position indicator
s.s.b. =single sideband
d.s.b. =double sideband
s.w.r. =standing wave ratio
v.f.o. =variable frequency oscillator
R.T. =radiotelephony
W.T. =wireless telegraphy
TV =television

* No clearly defined limits.

Section I—1946

Index to

Abstracts and References

All Abstracts and References which appeared in PROCEEDINGS OF THE IRE from June, 1946 (when they first were published as reprints from *Wireless Engineer*, London, England) through December, 1946, are indexed by author and subject in Section I. Section I also contains the index of all Abstracts and References previously published in *Wireless Engineer* from January through May of the same year.

AUTHOR INDEX

AUTHOR INDEX—A name followed by "and" is that of the first author of a jointly written paper, while the word "with" indicates that the name indexed is that of the second author.

A

Abelé, J., kinematic definition of relaxation oscillations, 2525
Abele, M., e.m. field in cavity resonator, 3265
Abraham, M. K. N., broadcasting aerial at Trivandrum, 552
Acheson, M. A., proximity fuse tubes, (A) 1398
Adam, M., stratovision system, 2370 ; 1945 Paris Fair, 2440
Adams, H. E., line-switching system, 2044
Adams, N. I., Jr., with L. Page, space charge between coaxial cylinders, 485, in magnetron, cylindrical, 3478, plane, 3477
Adams, P. R., long-range navigation systems, operating conditions, (A) 1528
Adirovich, E., plasma, oscillation and relaxation, 1811, waves and electron beams, 1813
Adler, R., locking phenomena in oscillators, 2522 ; re-entrant pentode a.f. amplifier, 3122
—— F. M. Bailey and H. P. Thomas, phase and frequency modulation, (A) 1666
Afanasieva, V. I., harmonic analysis of earth's magnetic field, 1837
Agnew, N. F., triboelectric sorting of alloys, 3367
Agnew, W. B. R., interference-free weatherometer, 943
Aisberg, E., automatic selectivity control, 1664 ; radar, 3610
Akeley, E. S., electron accelerator, cavity for, (A) 2277, e.m. modes in, (A) 1516 ; resonant slit in waveguide partition, (A) 3541
—— with P. Feuer, scattering in circular waveguide, (A) 3542
Albin, F. G., intermodulation distortion in sound-film recording, 1157
Albrecht, F., airport communication systems, 1679
Alexander, A. L., P. King and J. E. Dinger, paint-thickness meter, 2260
Alexander, P., diffusion pump, 1868
Alford, A., f.m. aerial, (A) 1448 ; slotted tubular aerial, 2823
—— and M. Fuchs, dipole construction, (A) 1451
—— and G. K. Patterson, modulation circuit, (A) 1548
—— and others, aircraft u.h.f. course indicator, 932 ; v.h.f. aerials and d.f. systems, (A) 1448
Alger, P. L., quality control, 2421
—— and others, developments in design engineering, 2096, materials, 1558
Alichanian, A., A. Alichanow and S. Nikitin, cosmic rays, 1816
—— with A. Alichanow, cosmic rays, 73
Alichanow, A., and A. Alichanian, cosmic rays, 73
—— with others, cosmic rays, 1816
Allan, J. M., localizing cable faults, 3345
Allan, W. K., circuit demonstration devices, 3148
Allanson, J. T., ferromagnetic permeability 10^6–10^{10} c/s, 645, 2608
—— R. Cooper and T. G. Cowling, right-angled junctions in waveguides, 2134, (A) 3173
Allen, C. W., variation of solar radiation, 1827
Allen, W. H., amateur bands receiver, 1980 ; amateur test equipment, 2970 ; frequency multiplication and keying, 2067 ; practical break-in operation, 3050 ; r.f. power amplifiers, 1801 ; station design and planning, 1058
Allsop, S. T., radar in merchant ships, 1246
Almy, G. M., with others, removal of electron beam from betatron, 3439
Al'perin, M., scattering of light by electrons, 2537
Al'pert, Ya.L. (J.L.), and V. L. Ginsburg, absorption of radio waves in ionosphere, 3007
—— and B. N. Gorozhankin, coastal refraction, 161 ; ionosphere and solar eclipses, 2892, 1945 eclipse, 2893
—— and V. V. Migulin, effect of earth on e.m. propagation, 1639
Altar, W., circle diagram for resonant microwave systems, (A) 3555
—— F. B. Marshall and L. P. Hunter, probe error in waveguide standing-wave detectors, 981
Altmann, G. O., with H. Beller, high permeability dust cores, 644
Altomare, R. E., transigenerator, 3358
Altovsky, V., with A. G. Clavier, cm-wave communication, 402, 1971
Altschüler, S., E. Zavoiski and V. Kozirev, paramagnetic absorption, 2543
Ambarzumian, V., diffuse reflection of light, 1809
American Hearing Aid Association, hearing aid specifications, 276
American Institute of Electrical Engineers, engineering profession organization, 2411 ; quality control, 805, 1411, 1412, 2422, 2423 ; treatment for electric shock, 508
American Society for Testing Materials, A.S.T.M. Standards on Electrical Insulating Materials (B), 1274, 1895
Amirkhanoff, Kh., rectification by semiconductors, 2601 ; temperature gradient in copper oxide rectifiers, 2602 ; thermal rectification of lead sulphide, 2552
Ammon, R., production testing of d.c. panel meters, 1585
Ammon, R. A., r.f. soldering, 1616
Amos, S. W., push-pull circuit analysis, 879
—— and F. C. Brooker, microphones, 1755, 2120, 2458, 2801
Amrein, W., and A. von Wattenwyl, c.r. time-interval measurement, 864
Ananthakrishnan, R., thermal structure of upper troposphere, 1838
Anderson, A. B., with others, stereophonic sound-film equipment, 5
Anderson, A. L., hermetic sealing, 2106
Anderson, A. R., cylindrical shielding, 2167
—— and A. M. Winchell, flexible waveguides, 3543
Anderson, L. J., high-fidelity headphones, 15
Anderson, T. F., electron microscope shadow-casting adaptor, 1949
Anderson, W. A., alarm system for panoramic receivers, 3078
Anderson, W. H., graphical determination of horizon, 400 ; voltage regulation with gas-filled valves, 801
Andrew, V. J., efficiency of short aerial, 1454
Andrews, C. L., microwave diffraction at circular aperture, (A) 3717
Andrews, F. E., and G. D. McCann, lightning protection of h.t. lines, 780, (D) 2334
Andrews, H. L., and B. L. Horecker, colorimeter for blood analysis, 987
Andrews, P. D., balancing system, 3197
Andreyev, N. N., L. M. Brekhovskikh and L. D. Rosenberg, sound radiation in water, 1745
Andrianov, A., impulse emission of oxide cathodes, (A) 2076
Andronov, A., and G. Gorelik, resonance phenomena in cyclotron, 2885
Angel, Y., video standard, 2740
Angles, R. M., electrodeposition of Sn-Zn alloys, 2941
—— and R. Kerr, corrosion resistance of Sn-Zn alloys, 2599
Anon.
"**A. Mateur**", test of significance, 3492
B.G., Hammarlund HQ-129-X receiver, 2881 ; single-signal c.w. reception, 1659
B.V.A. See British Radio Valve Manufacturers' Association
D., history of cable technology, 543
D.G.F., cavity magnetrons, 1401 ; colour television, 2061 ; f.m. altimeter, 1863 ; loran, 605 ; receiver-indicator, 606 ; radar, 83, 87, 608, 609, 612, 1530, 1587, countermeasures, 1356
F.H., vibration control for electronic products, 95
F.L.D., radar transmitters and receivers, 2751
F.R., circuits for miniature triode, 2149 ; proximity fuse, 688
G.G., broadcast interference, 3789 ; f.m. detector without limiter, 891 ; frequency-shift keying, 2764 ; waveguides, 284, 1447, simple theory, 646 ; [illegible] amplifier, 1495
G.T.M., radio aids for civil aviation, [illegible]
G.W.O.H., aerial resistance and cable impedance, 1176 ; Biot Savart law and Newton's laws, 70 ; definition of magnetic field strength, 2879 ; effective area of aerials and transmitted power, (D) 3185 ; effective length of dipole, 1449 ; electromagnetic problems, 2545 ; electronic mass and radius, 906 ; equivalent circuit of multivibrator, 307 ; iron-cored loop receiving aerial, 2485 ; problem of two electrons, 913, 2547 ; relative or absolute rotation, 3564
H.B.D., measuring aircraft speed by radar, 397, radar valve development, 2778
K.B.W., new F.C.C. amateur radio rules, 2305
K.H., sonobuoy, 1855 ; 2700 Mc/s transceiver, 3458
M.A., French broadcasting programme, 2318 ; proximity fuse, 2279
M.G.S., radar valve development, 2778
R.R.B., colour television, 2375 ; electronic *vs* other methods of control, 3690
W.MacD., electronic night sight, 2661
W.T.C., a.c./d.c. voltage dropping, 3037 ; mounting for piezoelectric microphones, 14 ; pulse circuits, 2527 ; radar aerials, 2486
Anselm, A., theory of dipole liquids in strong fields, 2540
Applegarth, A. R., television synchronizing generators, 1488
Appleton, E. V., F_2 ionization and magnetic dip, 2896 ; radiolocation, 3286 ; scientist in wartime, Hawksley lecture, (A) 2420 ; solar noise radiation, 323, (D) 917 ; work of D.S.I.R., 491
Apstein, M., and M. Joffe, LC circuit for 140–450 Mc/s oscillator, 1484
Aram, N. W., with others, metre-wave field strengths, (A) 1636
Aranovich, P., secondary emission electron devices, (A) 2390
von Ardenne, M., electron-microscope cinematography, 1009
Argento, H. F., cm-wave magnetrons, 800
Arlick, A. B., earth's electric field, 2185 ; magnitude of earth's charge, 2184
Armstrong, E. H., mathematical theory *vs* physical concept, 502
Armstrong, E. J., effect of X rays on quartz, (A) 1265 ; X-ray study of crystal surfaces, 2611
Arnett, R. A., and R. C. Jensen, navigation and obstacle-detection radar, (A) 1847
—— with R. C. Jensen, airborne radar in peacetime, 2580
Arnold, H. H., electronic volt-ohmmeter, 375
Aronson, M., with C. Ryerson, transient peak voltmeter, 121
Artzt, M., amplitude modulator for facsimile, (A) 1390
Ashworth, F., W. Needham and R. W. Sillars, non-ohmic resistors, (A) 1885, (A) 2606
Atherton, R., Principles of Radio for Operators (B), 2790
Atkins, B. R., vacuum stirrer, 2590
Atlee, Z. J., industrial X-ray tubes, 769
Atwood, J. B., with others, comparison of frequency-shift and on-off keying, 2306
Auger, P., What are Cosmic Rays (B), 79
Aurell, C. G., telephone cables with twisted conductor groups, 1172
Austen, A. E. W., and H. Pelzer, linear 'curves of best fit', 2960
Austrian, R. B., films in television programmes, 3800
Autler, S. H., G. E. Becker and J. M. B. Kellogg, microwave absorption in water vapour, (A) 3719
Avanessoff, I., coils with iron-dust cores, 3435
Avramy, M., robot dynamics, (A) 3381
Ayres, R. C., static discharger for aircraft, (A) 2437

B

Babcock, H. W., code translator, 2730, 3792
Bachman, C. H., ion burn in c.r. tubes, 3824 ; oil diffusion vacuum pump, 938
Bachman, W. S., gramophone pickup design, (A) 1754, 2115 ; loop-aerial coupling-transformer design, 856
Bachmeier, A. J., with S. Bateson, thermally evaporated anti-reflection films, 3306
Badessa, R. S., mixer frequency charts, 3737
Badmaieff, A., f.m. circuit for vibratory systems, 1144 ; f.m. gramophone pickup, 1752
Baer, W, moving-coil microphone, (A) 1161
Baerwald, H. G., tracking-error and pickup design, theory, 21
Bailey, F. M., with others, phase and frequency modulation, (A) 1666
Bailey, R. H., damage to wire by hot solder, 2230 ; gramophone record spotter, 1426
Baird, J. L., "telechrome" colour television tube, 448
Baker, E. W., wide-band carrier-telephony, 286
Baker, G., h.v. rectifier, (A) 1730
Baker, G. T., computation problems in circuit design, 3365
Baker, R. F., with J. Hillier, resolution of electron diffraction cameras, 1314
Baker, R. M., induction heating of moving magnetic strip, 147
—— and C. J. Madsen, h.f. heating of conductors and non-conductors, 146
Baker, W. R. G., radio and television developments, 222
Balbi, C. M. R., deaf-aid earphone, 2460
Bales, P. D., with H. Goldstein, c.r.o. photography, 1693
Baltá Elias, J., velocity-modulated oscillators, 2081
Band, W., collective electron ferromagnetism, 2882
—— with N.T. Sun, anomalous thermionic emission current, 1513
Banerjee, B. K., with M. N. Saha, wave propagation theory, ionosphere, 3720
Banerjee, B. M., pulse generator, 1210
Banerjee, S. S., and G. C. Mukerjee, s.w. fading, 2290
Banner, J., u.s.w. wavemeter, 3680
Bannon, J., evaporation of MgF_2 films, 2598
—— and F. W. Wood, cause and effect in F_2 layer, 1839
Banthorpe, C. H., voltmeter for complex waveforms, 377
Bantle, W., B. Matthias and P. Scherrer, wide-band crystal filters, 579
Banyard, W. H., photography in research, 1568
Bard, B. J. A., industry and research in Gt. Britain, 1410
Bargellini, P. L., u.h.f. oscillator circuit, 3215
Barnes, C. C., current rating of power cables, 2811
Barnes, R. B., C. J. Burton and R. G. Scott, electron microscope replica techniques, 1006
—— with others, electron diffraction, 1005
Barnett, S. J., Strasbourg conference on magnetism, 2597
Barrett, J. H., phase relationships, (D) 2519
Barron, H., Modern Plastics (B), 359, 960
Bartels, J., geomagnetism and solar radiation, 2557
Barthélemy, R., cloud-height detector, 2657 ; isoscope television camera, 445 ; transmission of angles, 2264
Bartlett, J. G., D. S. Watson and G. Bradfield, radar displays, (A) 1857
Barton, D., beat-frequency interference chart, 1990
Batcher, R. R., f.m. systems engineering, 2313 ; industrial relay control circuits, 1321
Bateman, H., integral equations of potential theory, 1572 ; Schuster's integral, 1599
Bates, L. F., magnetic potentiometer study of permanent magnets, 2939
Bateson, S., and A. J. Bachmeier, thermally evaporated anti-reflection films, 3306
Bauchman, R. W., with M. Katzin, u.s.w. propagation in low level ducts, (A) 1636
Baud, R. V., magnetism and testing of materials, 3692
Bauer, B. B., gramophone pickup compensation circuits, 535
Baule, B., Die Mathematik des Naturforschers und Ingenieurs (B), 662
Baum, R., graphical solution of four-terminal networks, 1786, 2500
Baum, R. F., design of broad band i.f. amplifiers, 3223
Baumann, H. C., r.f. power unit for c.r. tube, 2045
Bausch, W., Schalldämmungs-Messungen im Laboratorium und in fertigen Gebäuden (B), 844
Bax, P., television studio layout, 3426
Bayard, M., symbolic calculus and discontinuities, 962
Beard, E. G., f.m. *vs* a.m., survey, 1674
Becker, C., stereophon sound recording system, 2198
Becker, G. E., with others, microwave absorption in water vapour, (A) 3719
Beckman, C., with C. H. Gleason, pulse response of thyratron circuits, 1186
Bedeau, F., characteristic impedance in optics and acoustics, 3262 ; low-impedance loops for reception, 3186
Bedford, L. H., post-war television and broadcast receiver design, (D) 714 ; pulse modulation, 1092
Beeman, W. W., with A. F. LeMieux, X-ray tube current and voltage stabilization, 2330
Beers, Y., with others, f.m. for physical measurements, (A) 3347
Beggs, G. E., Jr, bridging amplifier for f.m. monitoring, 1199
Beggs, J. E., load lamp for microwave power measurements, 2638
Begun, S. J., magnetic recording, (A) 1431, (A) 2125
Beldi, F., with others, Brown Boveri h.v. laboratory, 3134
Belin, R., with K. Kreielsheimer, radiosonde recording of potential gradients, 1955
Bell, D. A., anomalous attenuation in waveguides, 3540 ; diode input resistance, (D) 1083 ; frequency modulator, (A) 1349 ; noise fluctuations in receivers, 1038, (A) 3021 ; triode equivalent circuits, 53, 364
—— with K. I. Jones, u.h.f. and post-war broadcasting, 494
Bell, W. L., with R. R. Scoville, noise-reduction systems for sound films, 273
Bellac, P., television screen size, 1388
Beller, H., and G. O. Altmann, high permeability dust cores, 644
Belles, H. W., reduction of heterodyne interference, 728
Bellman, R., stability of differential equation systems, 2954
Benin, Z., home receiver design, 3735
Bennett, R., electronics in naval warfare, (A) 1618 ; underwater sound equipment, (A) 1481
Bennett, W. R., distortion reduction in modulators, (A) 1489
Bennington, T. W., E layer ionospheric storm effects, 2899 ; ionosphere and s.w. broadcasting, 3395 ; new sunspot cycle, 1235 ; propagation forecast for April, 1965, May, 2674, June, 2675, July, 3016 ; short-wave ionospheric forecasting, 3321
Benoit, J., oscillographic power measurement, 2637
Benther, K., with others, supersonic degassing of metal alloys, 392
Benzer, S., photo-effects in germanium, (A) 3314, (A) 3684
Beranek, L. L., intelligible speech-transmission systems, (A) 3526
—— and H. P. Sleeper, Jr, anechoic sound rooms, 3529
Bergmann, L., Der Ultraschall und seine Anwendung in Wissenschaft und Technik (B), 280
Bergmann, P. G., wave propagation in inhomogeneous medium, (A) 1329, 2170, 2283
Beringer, R., absorption of ½-cm waves in oxygen, 3396
Berkner, L. V., naval airborne radar, (A) 1588
Berlin, T. H., with D. M. Dennison, synchrotron, orbit stability, 3440, racetrack, 3437
Bernard, P., solar activity and geomagnetism, 1828
Bernard, W. B., LCR meter, 2648
Bernhardt, J., reactance variation, 3795
Berry, C. E., and others, computer for simultaneous equations, 1927
Berry, F. M., remote record-selection system, 2664
Berry, S. D., with others, precision amplifier-detector, 2644
Berstein, I. L., oersted-meter, 2968
Bertram, G. E. M., merchant navy radar, 613
Bertsche, G., tone control, 541
Bertschinger, A., construction of small valves, 3476
Besson, P., frequency modulation, survey, 2703, 3418
Best, F. A., Jr, with others, radar for aircraft fire-control, (A) 1523
Best, J. H., vibration testing, 2097
Beurtheret, C., Monobloc m.w. transmitters, 3806
Bevan, P. A. T., rectifiers for high-power transmitters, 896, (A) 1072, (A) 2019
Bhagavantam, S., elastic constants of crystals, 2213
—— and D. Suryanarayana, shear modes in piezoelectric crystals, 684
Bhar, J. N., with S. K. Mitra, radar, 928
Bhatia, A. B., with K. S. Krishnan, resistance of liquid alkali metals, 342
Bhattacharyya, K. K., with H. Rakshit, RC oscillator, 1796
Biberman, L. S., attenuation curve plotting, 3196
Bichsel, H. J., capacitor-charging rectifier, 1364
Biddulph, R., with E. C. Wente, light-valve for film sound recording, 8
—— with others, stereophonic sound-film equipment, 5
Bieberbach, L., Lehrbuch der Funktionentheorie (B), 1878
Biefer, H., valve equivalent circuit, 1187
Bierl, R., light-bands on gramophone records, 524
Bierwirth, R. A., with others, r.f. drying of penicillin, 1306
Bigelow, M. H., with others, The New Plastics (B), 961
Biggs, A. J., and G. M. Wells, quartz crystal activity measurement, 968, 2625
Bingley, F. J., terrain profile plotting, 1067 ; v.h.f. television relay network, 187
Birkinshaw, D. C., and D. R. Campbell, television studio technique, 229, 781, (D) 3092
Biskeborn, M. C., r.f. cable power ratings, (A) 2180
Bitter, F., and others, superconductivity of lead at λ 3 cm, 3256
Black, H. S., microwave relay system, 1066
Blake, G. G., mechanical analogy to oscillatory circuit, 3158
Blanc-Lapierre, A., and J. Chantereau, television pickup tubes, 3472
Blanchet, P., preferred numbers and filter design, (D) 2502
Blasi, E. A., and G. C. Schutz, radar field maintenance test equipment, (A) 1576
Blatt, W. N., with others, precipitation-static aircraft instrumentation, 1992
Blatterman, A. S., sensitivity limits in receiver manufacture, 715
Bleaney, B., and R. P. Penrose, microwave absorption spectrum of ammonia, 2622, (C) 3237
Blewett, J. P., radiation losses in electron accelerators, 2039
—— D. A. Wilbur and L. D. Roberts, split anode magnetrons, 100–800 Mc/s, (A) 3479
Blewett, M. H., with H. Poritsky, field determination by overlapping regions, 1571
Bloch, A., electromechanical analogies, 293 ; intermodulation product calculation, 2163, (A) 2851, 2852
Bloch, I., mesotron production in stratosphere, 3600
Blom, J. P., with W. W. Honnor, military aircraft transmitter-receiver, 3023
Bloom, R., signal tracer for receiver servicing, 985
Bloser, D. W., and G. R. Holt, timer for aircraft de-icer, 704
Bode, H., electronic musical instruments, 841
Bode, H. W., Network Analysis and Feedback Amplifier Design (B), 583, 2169
Boella, M., high precision standard frequency generator, 3354
de Boer, K., stereophonic reproduction, 2798
Bogdanova, N., breakdown strength of dielectrics, 2605
Boggs, F. W., principles of resnatron, (A) 3822
Bohlin, T., 8-channel carrier telephone system, 3044
Bolt, F. D., with F. C. McLean, transmission lines for broadcasting, 281, 2139, (A) 3180
Bolt, R. H., acoustical frequencies in rectangular room, 3528
Bolton, H. C., with G. Williams, impedance concept applied to waveguides, 3178
Bomberger, D. C., servomechanisms, 512
Bond, W. L., orienting and cutting synthetic crystals, (A) 1282
Bonnar, W. F., cathodic protection and selenium rectifiers, (C) 3433
Boone, A. R., army relay equipment, [illegible]

Booth, C. F., quartz clock, 3388
—— and F. J. M. Laver, frequency standard and applications, 2973
Bordoni, P. G., conical sound source, 266, (C) 2123, (A) 3159 ; microphones, and mechanical impedance, 3165 ; Stokes functions, 3330 ; study of sound sources, (A) 3157
Borelius, G., and K. A. Paulson, amorphous and crystalline selenium, 3308
Boring, M. M., A. R. Stevenson, Jr, and K. B. McEachron, Jr, curricula of U.S. engineering colleges, 1124
Born, M., R. Fürth and R. W. Pringle, photoelectric Fourier transformer, (A) 656
Bosomworth, G. P., with E. Mittelmann, electronic rubber preheater, 1618
Bostick, W. H., pulse transformer ratings and design methods, (A) 3551
Bosworth, R. C. L., adsorption, studied by contact p.d., 3590
Bousquet, A. G., G-M counter for nuclear research, 3759
Bovcheverov, V.M., and others, polarization and ionization at half-light, 1641
Bovill, C. B., aircraft aerials, 34
Bowden, F. P., mechanism of friction, survey, 1219
Bowden, F. W., with L. S. Trimble, coloured-trace oscillograms, 2239
Bowditch, F. T., M. R. Null, and R. J. Zavesky, arcs for television lighting, 3084
Bowen, E. G., radar applications, civil, 3289, military, 2907, history, 1854
—— O. O. Pulley and J. S. Gooden, pulse technique for particle acceleration, 2997
Bown, R., radio relaying, 422
Boyer, R. F., and R. D. Heidenreich, molecular weight of high polymers, 351
—— and R. S. Spencer, thermal expansion anomaly in high polymers, 350
——with R. S. Spencer, thermal transitions in high polymers, 2938
Boykin, J. R., f.m. frequency control system, 2385
Bozorth, R. M., magnetization and stress, 2224 ; magneto-resistance and domain theory, (A) 3248
Bradfield, G., with others, radar displays, (A) 1857
Bradley, W. E., converting 112 Mc/s equipment for 144 Mc/s, 469 ; four-band exciter, 1718
—— with D. B. Smith, impulse noise in f.m. receivers, (A) 1649
Bradshaw, J., screw clearances before plating, 2940
Bragg, W. L., magnetic materials, 642
Brailsford, F., condenser-discharge magnetizer for permanent magnets, 3773
Brailsford, J. D., two-crystal bandpass filters, 3225
Braithwaite, C. H., with D. L. Gibson, quality control of insulating varnishes, 101
Brand, K. G., with P. R. Coursey, dielectric constants of titanates, 3319
Brandenburg, H., Sechsstellige trigonometrische Tafel (B), 113
Brannin, J. W., i.f. and a.f. amplifier, 1494
Brans, P. H., Radio Valve Vade Mecum, 1945 (B), 1115
Brattain, W. H., rectification series, (A) 3628
Brauer, P., temperature limit of phosphor luminescence, 447
Breazeale, W. M., valve voltmeter, 1922
—— with L. R. Quarles, range of radar sets, 3607
Brekhovskikh (Brekhovskich), L. M., radiation of gravitational waves by e.m. waves, 2881 ; sound, propagation through layer, 1422, radiation in water, 1744
—— with others, sound radiation in water, 1745
Brennan, C. G., high fidelity amplifier and receiver, 2512
Brenot, P., French industrial research during war, 1105
Breskin, C. A., friction bonding of thermoplastics, 1566
de Bretteville, A., Jr, dielectric properties of barium titanate, (A) 3626
Brewer, A. W., with others, meteorology of lower stratosphere, 3278
Brice, D., blind approach systems, 3297
Brier, H. S., five-band amateur transmitter, 1719
—— with J. Wonsowicz, 135–500 Mc/s signal generator, 1298
Briggs, L. J., war and science, 2419
Briggs, M. R., broadcast transmitter design survey, 3450 ; SCR radar equipments, (A) 1847
Brillouin, L. N., Mathematics of Ultra-High Frequencies in Radio (B), 1280
Brinkley J. R., multi-carrier v.h.f. communication system, 1357, 2326, (A) 3424
Brissie, E. F., loran, 1532
British Association, Circular and Hyperbolic Functions, Exponential and Sine and Cosine Integrals, Factorial Function and Allied Functions, Hermitian Probability Functions (B), 2620 ; scientific research and industrial planning, 1118
British Institution of Radio Engineers, post-war television proposals, 456
British Radio Valve Manufacturers' Association, valve symbols, 3111
British Standards Institution, glossary of television terms, 453 ; recommendations for tropicalization packaging, 520
British Thomson-Houston Co., amplidyne electrical control system, 3765
Brockbank, R. A., and C. F. Floyd, Unit Bay 1B transmission system, 184, 2000, 3744
Brockelsby, C. F., moisture meter, 992
Brockman, F. G., nickel bolometers, 1556 ; suppressed-range peak voltmeter, 2633
—— with C. H. Schlesman, a.c. bolometer for infra-red spectroscopy, 984
Brody, S. B., with D. D'Eustachio, multi-crystalline quartz, (A) 3310
de Broglie, L., Problèmes de Propagations Guidees des Ondes Électromagnétiques (B), 2491
Bronwell, A. B., electron transit time, 1735 ; engineering education, 507
Brooker, F. C., with S. W. Amos, microphones, 1755, 2120, 2458, 2801
Brooker, V. M., sound recording, 536
Brouse, H. L., plastics, review, 957
Browder, J. E., and V. J. Young, microwave transmission, power requirements, 482
Brown, F. C., photoconductivity in Si crystals, (A) 3620
Brown, F. W., with C. R. Nisewanger, explosion velocity chronoscope, 2261
Brown, G. H., R.C.A. Antennalyzer, 286
—— R. A. Bierwirth and C. N. Hoyler, r.f. drying of penicillin, 1308
Brown, G. P., silicones as diffusion pump oils, 357
Brown, H. N., low temperature at low cost, 3060
Brown M. J., carrier currents on power cables, 189
Brown, O. F., D.S.I.R. grants to research workers, 3130
Brown, S. C., pre-corona discharge and voltage stabilizers, (A) 3758
—— with M. A. Herlin, u.h.f. gaseous discharge, (A) 3574
Brown, W. F., pressure/time recorder for motor cylinders, 1624
Brown, W. F., Jr, and J. H. Sweer, fluxball magnetic test coil, 974
Brown, W. J., pocket receiver, 717
Brubaker, W. M., and V. Wouk, vacuum leak tester, 1551
Bruck, G. G., circuit for f.m. gramophone pickup, 2853 ; f.m. detector, (A) 1491
Bruck, H., and P. Grivet, electrostatic electron microscope, 3706
de Bruin, S. L., stroboscopic light, 2050
Brunetti, C., and A. S. Khouri, printed electronic circuits, 1887
—— with W. S. Hinman, Jr, radio proximity fuse design, 3713
Brunner, W., provisional sunspot numbers for July-Sept. 1945, 595
Bryan, F. R., with G. A. Nahstoll, multiplier photocell for spectrochemical analysis, 385
Bryce, W. A., and H. Tessier, sealing evacuated tins, 1554
Bryl, Z., bridged-T null networks, 1465
Buchmann, W., strength of polyvinyl chloride plastics, 958
Bucky, P. A., auditorium reproduction, 1163
Budlong, A. L., Inter-American Radio Conference, 1123
Buechner, W. W., and others, h.v. electrostatic generator, (A) 3777
Builder, G., negative feedback, 42, and mains hum, 1477, to signal detectors, 1663
Bulgakov, B. V., servomechanisms, theory, 1907
Bullock, T. H., double-beam c.r. tube in biology, 3072
Burbank, C. J., acoustic reflection from various objects, (A) 1746
Burgaud, M., magnetic storms and solar eruptions, 2566
Burgess, E., coaxial switch, 383
Burgess, H., construction of grid dip meter, 3355
Burgess, R. E., aerial-to-line couplings, 2835 ; diode input resistance, (D) 1033 ; oscillator power relations, 3216 ; problem of two electrons, 2547 ; receiving aerials, iron-cored loop, 2485, noise in, 2699 ; spectrum of ph.m. or f.m. wave, 2704
Burgholz, —., ground-transmission telephony in mines, (A) 1045
Burk, R. E., and O. Grummitt, Major Instruments of Science and their Applications to Chemistry (B), 1633
Burkard, O., ionospheric propagation of short waves, 710
Burks, A. W., Eniac computer, 2995
Burnand, W. E., invention and patents, 501
Burnett, H. G., with G. D. Perkins, construction of line oscillators, 3102
Burrill, E. A., with others, h.v. electrostatic generator, (A) 3777
Burrows, R. P., with others, airborne radar equipment, (A) 1528
Burton, C. J., with others, electron diffraction, 1005 ; electron microscope replica techniques, 1006
Bush, V., Science—the Endless Frontier, (D) 492, (D) 493
—— and S. H. Caldwell, differential analyser, 361, (C) 2234
Bushby, T. R. W., with J. B. Rudd, military aircraft receiver, 3032
Busignies, H., automatic d.f., (D) 2914 ; night errors in aircraft d.f., 2913 ; r.f. solid dielectric cables, 1765
Buss, R. R., with others, u.h.f. receivers, (A) 1649
Bustard, H. A., phase inverters, 2516
Butler, F., series-resonant crystal oscillators, 2524
Butsloff, M. M., with P. M. Morozoff, caesium oxide photocathodes, (A) 2033, 3781
Butz, A. N., Jr, surgeless volume expander, 3226
Byers, H. R., General Meteorology (B), 3508
Byers, W. F., with H. H. Scott, amplifier and null detector, 2634
Bykhovskaya, L. N., with B. L. Granovsky, oscillations of low-pressure Hg arc, 2871
Byrnes, I. F., merchant marine radar, 2194

C

Cafferata, H., horizontal rhombics, formula, 1456 3188
Cahoon R. D., CBC Sackville broadcasting station, 744
Calbick, C. J., ionization gauge circuit, (A) 629
Caldwell, G. A., and C. Madsen, electronic engineering applications, 2273
Caldwell, S. H., with V. Bush, differential analyser, 361, (C) 2234
Caldwell, W.C., bandpass t.r. switches, (A) 3817
Callender, A., solution of equations with planimeters, 2614
Cameron, E. L., battery operated v.h.f. receiver, 2295
Camp, G. D., impedance representation of tangential boundary conditions, 3255
Campbell, D. R., with D. C. Birkinshaw, television studio technique, 229, 781. (D) 3092
Campbell, N. R., and V. J. Francis, valve and circuit noise, theory, 1037, (A) 2696
—— V. J. Francis and E. G. James, noise factor of amplifiers, 1191, 1471
Campbell, R. E., and L. E. Greenlee, photo-electronic organ, 2668
Campbell, R. L., and others, mobile television equipment, 460
Camras, M., magnetic-wire recording, theory, 3167
Cance, J. C. R., ionization times of thyratrons, 2089
Carbenay, F., aperiodic d.f. sense-indicator, 2575
Carhart, R., deafness tests, 2116
Carlisle, R. W., with others, midget earphones, (A) 3534
Carlson, F. D., with others, effect of altitude on speech and hearing, (A) [illegible]
Carlson, O. E., a.c. voltmeters, 1588
Carnahan, C. W., metre-wave field strengths, (A) 1028, (A) 1334
—— N. W. Aram and E. F. Classen, metre-wave field strengths, (A) 1636
Carrara, N., synchronization and frequency division, 3214
Carsten, H. R. F., h.f. properties of screened twin cable, (A) 551
Carter, C. J., airborne radar navigation, 1849
Carter, E. G., science and education, 3144
Carter, G. W., Simple Calculation of Electrical Transients (B), 581
Cassell, W. L., simplified method of wave analysis, 972
Casti, R., h.f. surface hardening of steel, 3693
Cater, R. M., German midget receivers, 2294
"Cathode Ray". See Wireless World
Cavaleri, V., r.f.–i.f.–a.f. signal tracer, 1299
Cavanagh, P. E., E. R. Mann and R. T. Cavanagh, magnetic testing of ferromagnetic metals, 3644
Cavanagh, R. T., with others, magnetic testing of ferromagnetic metals, 3644
Cawein, M., television projection resolution, theory, 1691
Cazaly, W. H., television and society, 235
Chai Yeh. See under Yeh
Chakravarti, S. P., ionosphere eclipse observations, 1832 ; u.s.w. broadcasting in India, 746
—— with P. N. Das, Barkhausen oscillator, 803
Chalfin, N. L., tester for coil short-circuit, 2640
Chamberlain, H. H., with H. T. Wrobel, testing of photocells, 2035
Chambers, A. G., plastics, methods of working, 956, 1892
Chambers, T. H., with others, colour television, 452
Champeix, R., oxide-cathode saturation current, 2779, 3810
Chanson, P., electron optics and electron microscope, 3384
—— with others, proton microscope, 2659
Chantereau, J., with A. Blanc-Lapierre, television pickup tubes, 3472
—— with M. Matricon, transmitter valve manufacturing technique, 3482
—— with others, transmitter valves, 490, 1110
Chapman, A. T., manufacture of silvered mica capacitors, 755
Chapman, S., nomenclature : geonomy, aeronomy, 1833
Charles, D., h.f. rectification by photocells, 2725, 2726
Charlesby, A., polythene structure, thin films, 639, variation with temperature, 640
Charlton, E. E., with W. D. Coolidge, X-ray tube developments, 770, 1371
—— with W. F. Westendorp, 10^8-V electron accelerator, 438
Charny, I. A., heat losses from buried cable, 1508
Chase, G. A., conversion of battery receiver to mains, 725
Chatfield, H. W., and J. H. Wreddon, Varnished Cloths for Electrical Insulation (B), 3648
Chatterjea, P. K., and C. T. Scully, d.c. amplifier coupling, (A) [illegible]
Chéchan, C., fluorescence of solutions, 2592
Cheek, R. C., modulation for carrier-current systems, 190
Cherry, D. W., and A. T. Stovold, earth currents in short submarine cables, 2895
Cherry, E. C., pulse response of circuits, (A) 563
Chertok, S. L., humidity resistance in amplifier design, 294
Chesley, F. G., with others, photo behaviour of thallous sulphide, (A) 3624
Chevallier, A., Télétransmissions par Ondes Porteuses dans les Réseaux de Transport d'Énergie à Haute Tension (B), 3192
Chhabra, B. D., H. R. Sarna and M. Parkash, oscillograms of valve characteristics, 2395
Chinn, H. A., CBS studio control equipment design, 2816 ; glossary of disk recording terms, 20
Chireix, H., mine detector, (A) 619 ; noise in pulse-modulation systems, 2307
Chrétien, L., Traité de Physique Électronique (B), 3269
Christaldi, P. S., and I. E. Lempert, c.r. tube selection and power supply, 775
Christensen, J., with others, v.h.f. aerials and d.f. systems, (A) 1448
Christian, S. M., integral of $\sin^2 x\, dx/x$, (A) 3331
Chrzanowski, P., with R. K. Cook, sound absorption and scattering by cylinders, 2112, 3162
Chu, H. C., with L. C. Tsien, harmonic oscillation of quartz crystal, 471
Ch'u, S. L., with others, cosmic radiation, asymmetry and absorption, 3271
Chute, G. M., Electronics in Industry (B), 3001
Cigánek, L., thermal circuit in electrical apparatus, 514
Clack, G. T., simplified coil testing, 366
Clark, F. M., and M. E. Scoville, Lectronol for induction-heater capacitors, 826, (D) 2229
Clark, H., a.f. and r.f. transmission line phenomena, 3176
Clark, J. W., with others, gas-discharge t.r. switch, 2783
Clark, K. E., with others, effect of altitude on speech and hearing, (A) 3523
Clark, R. A., Jr, railway radio communications, 1063
Clark, W. R., with A. J. Williams, Jr, power-level recorder, (A) 1576
—— with others, potentiometer recorder, 2249 ; recorder for flight testing and spectroscopy, (A) 1911
Clarke, J. L., novel transmission-line formulae, 2475
Clarke, W. J., polyethylenes, (A) 2130
Classen, E. F., with others, metre-wave field strengths, (A) 1636
Clavier, A. G., and V. Altovsky, cm-wave communication, 402, 1971
Clayton, R. J., and others, u.h.f. radio measurements, 1914, (A) 2963
Clegg, J. E., Consol beacon system, 2912
Clegg, W. E., engineer as administrator, 1126
de Cléjoulx, L. B., conference on European frequency allocations, 2702
Clemens, J. F., automatic remote tuning for transmitter, 1099
Cleveland, E. L., precipitation-static research, 3038
Clifford, F. G., RC oscillator, 306
Cobine, J. D., and J. R. Curry, range extender for sound analyser, 2456
—— and C. J. Gallagher, electronic noise source, (A) 3487 ; hot-cathode arc oscillations, (A) 3266, (A) 3267
Cocking, W. T., linear saw-tooth oscillator, 2526 ; television line-scanning amplifier, 3086 ; television v.f. stage, 3803 ; v.h.f. cathode-follower dangers, 1189 ; see also W.T.C. under Anon.
Cockram, R. W. J., circuit interruption, 3483
Cockrell, W. D., multicolour printing, 3697
Coggeshall, N. D., with E. Topanelian, Jr, metal packless vacuum valve, 1268
Cohen, I. B., harmonograph for Lissajous figures, 824
Cohen, R. M., R. C. Fortin and C. M. Morris, valves for f.m. conversion, (A) 1780
Cohen, T. A., electronic telemetering system, 389
Cole, A. D., with others, blind bombing radar, 2196, 2579
Cole, L. S., graphical waveform analysis, 102 ; monitoring broadcast frequencies, 2975
Colebrook, F. M., Basic Mathematics for Radio Students (B), 3338
Coleman, D. J., with J. D. Goodell, electronics in aviation, 1628
Coleman, E. F., cooling photosensitive cells, 2724
Coles, C. H., timing of sequence photographs, 1320
Collins, G., microwave magnetrons, (A) 1730
Collins, R. J., C. S. Gittoes and D. W. Rowed, equipment deterioration in tropics, 809
Colombo, S., and M. Parodi, transients in transmission lines, theory, [illegible]
Colt, R. B., with others, recorder-controller for temperature and humidity, 3371
Colton, R. B., Army communication equipment, 182 ; radar sets, 84
Colton, J. W., telemetry for pressure measurement, 3709
Columbia Univ. Statistical Research Group, Sequential Analysis of Statistical Data : Applications (B), 2444
Combined Intelligence Objectives Subcommittee, German u.h.f. receivers, 1648, valves, 1399
Condon, E. U., and L. F. Curtiss, radioactivity units, 3586
Conklin, E. H., frequency meters as master oscillators, 3099 ; sunspots and ionospheric propagation, 1086
Connatser, W. T., super-reflex radio, 1981
Connell, L. J. C., O. W. Humphreys and J. L. Rycroft, radiant and h.f. heating, 145, (A) 995, (D) 2268
Connon, J. A., vibration insulation and structural rubber, 96
Consumers Union of U.S., gramophone needle tests, 525
Contassot, M., three-channel amplifiers, 2845
Conwell, E., and V. F. Weisskopf, theory of impurity scattering in semiconductors, 2216
Cook, R. K., sound propagation over absorbent surfaces, (A) 3511
—— and P. Chrzanowski, sound absorption and scattering by cylinders, 2112, 3162
Cook, S. R., electronics, 72
Cooke, D., pulse modulation, 1053
Cooke, N. M., and J. Markus, Electronics Dictionary (B), 1741
Cooley, J. P., and J. H. Rohrbaugh, production of millimetre waves, 589
Coolidge, W. D., early X-ray developments, 1303
—— and E. E. Charlton, X-ray tube developments, 770, 1371
Cooper, C. E., phase relationships, 1794, (D) 2519
Cooper, G. R., moving-coil loudspeakers, 268
Cooper, H. J., Scientific Instruments (B), 2257
Cooper, R., r.f. properties of salt solution, 1880, (A) 3315
—— with others, right-angled junctions in waveguides, 2134, (A) 3173
Cooper, V. J., h.f. choke design, 435
—— and E. Green, design of directional aerials, 36
Cope, J. E., wide-band r.f. amplifier design, 576, (A) 1481
Copeland, P. L., and K. Rothschild, spotwelder for thin wires, 954
Corben, H. C., e.m. theory and gravitation, 71, 2172
Corbyn, D. B., empirical laws of nonlinear elements, 3195
Cordonnier, J., stereophonic broadcasting, 1064
Corke, R. L., crystal filters, 51
Cornelius, E. C., germanium crystal rectifiers, (A) 944, 1728 ; silicon u.h.f. detectors, 771
Corrington, M. S., f.m. distortion by multipath interference, 1041
Cosby, J. R., spectrograph exposure control, 1932
—— with others, radiosonde, 2280
Cosslett, V. E., electron microscope, 3245
Cotton, H., Electric Discharge Lamps (B), 3082
Coulson, T., library research, 2407
Courant, E. D., image force and tunnel effect in crystal rectifiers, (A) [illegible]
Coursey, P. R., and K. G. Brand, dielectric constants of titanates, 3319
Courtillot, E. P., f.m. reception, 3420
Courtney, J., railway radio, 2711
Coutlee, K. G., electrical grading of mica, 634
Cowles, F. R., piezoelectric crystal grinding, 1875
Cowles, L. G., resistance-coupled amplifiers, 59
Cowling, T. G., theories of sun's magnetic field, (A) 3275
—— with others, right-angled junctions in waveguides, 2134, (A) 3173
Cox, C. R., aerial ammeter, 1290 ; beaded coaxial lines, 3122
Cox, J. W., geophysics of ionosphere, survey, 3290
Cox, L. R., crystal oscillator stability, (A) 1294
Craggs, J. W., and C. J. Tranter, capacity of twin cable, 860, 1446
—— with C. J. Tranter, stress distribution in compressed cylinder, 106
Cramer, J., and W. B. Hoffman, Radio Sound Effects (B), 1444
Cranberg, L., sensory aid for blind, 1620
Crane, H. R., beam current stability in electron microscopes, (D) 1012 ; racetrack synchrotron, 3437
—— H. Levinstein and R. C. Williams, electron microscope shadow casting unit, 1007
Cravath, A. M., and others, electron microscopy, 1960
Creighton, J. L., piezoelectric quartz crystals, 91
Cripps, S., British pioneers of radar, 327
Crittenden, E. C., Jr, and W. E. Parkins, betatron beam removal, 3438
—— with others, metal evaporation techniques, 940
Crom, G. C., Jr, aircraft electrical equipment, 1930
Cronshey, R. W., aerial radiation pattern calculation, 33
Crosby, D. R., and C. H. Pennypacker, r.f. resistors as transmission lines, 1177
Crosby, M. G., exalted-carrier a.m. and ph.m. reception, (D) 1346 ; f.m. transmitter crystal control, 477 ; two-terminal oscillator, 2157
Cross, C., B.B.C. monitoring service, 1359
Cross, P. C., with others, microwave absorption of water vapour, (A) 3235
Crosswhite, H. M., with G. H. Dieke, spectrochemical analysis, 2266
—— with others, spectral intensity measurements, 2274
Crowell, E. F., and R. L. Parmenter, 2-m amateur transmitter, 2378
Crowther, J. A., discovery of X rays, 199
Cuckow, F. W., beam current stability in electron microscopes, (D) 1012

Curry, J. R., with J. D. Cobine, range extender for sound analyser, 2456
Curtis, W. E., and T. A. Littlefield, stereo-episcope, 504
Curtiss, L. F., with E. U. Condon, radioactivity units, 3586
Cwilong, B. M., with others, meteorology of lower stratosphere, 3278

D

Dahl, E. A., train communication system, 1358
Daly, E. F., and G. B. B. M. Sutherland, c.r. recording of infra-red spectra, 3373
Daniels, H. L., reactor measurements, 122
Darbyshire, J. A., new electrometer valve, 3823
Darwin, C., scientific intruments in Britain, 3832
Das, P. N., and S. P. Chakravarti, Barkhausen oscillator, 803
Das Gupta, N. N., with others, stability of specimens in electron microscopy, 3386
Datta, S., v.h.f. impedance bridge, 677
Davey, W. P., voltage regulator, (A) 1367
Davidov, B. I., voltage fluctuations in electronic semiconductors, 2603
Davidson, C. F., R. C. Looser, and J. C. Simmonds, power loss in e.m. screens, 1077
Davidson, D., loran indicator circuits, 1529
Davies, H., B.B.C. disk recorder, 832
Davis, F. C., tone compensator, 1761
Davis, H., and others, frequency characteristics for hearing aids, (A) 3538
Davis, H. B. O., boat radio installations, 795
Davis, R., high-voltage research at N.P.L., (A) 2415, 3138
Davis, R. J., with others, fire-control radar, 610, 1250, 1534
Davis, T. McL., naval u.h.f. communications receiver, (A) 1649
Davis, W., loran, 924
Davtjan, O. K., dielectric properties of electrolytes, 2883
Dawson, B. H., slide rule for addition of squares, 3333
Dayton, R. W., and G. M. Foley, capacitive micrometer, 3369
Dean, K. G., with F. J. Lehany, crystal filter theory, (A) 1206
Dearlove, F., automatic morse key, 2042
Dearnley, I. H., with others, electron capture and t.r. switch recovery, (A) 3818
De Cicco, J., with E. Kasner, Laplace equation transformation, 360
Deeter, E. L., grid blocking circuits, 1214
Degoumois, C., with others, Brown Boveri h.v. laboratory, 3134
De Greve, L., with A. Van Itterbeek, resistivity of thin Ni film, 343, 3305
DeKiep, J., L. R. Hill and G. L. Moses, silicone insulating materials, 98
De Lano, R. B., Jr, supersonic flaw detector, 1148
Dellinger, J. H., and N. Smith, sky-wave propagation during war, (A) 1636
Del Mar, W. A., polyethylene, (A) 2130
Dember, A. B., with others, radiosonde, 2280
Dempster, J. R., circular slide rule, 2956
Denmark, H. S., with others, photo behaviour of thallous sulphide, (A) 3624
Dennison, D. M., and T. H. Berlin, synchrotron, orbit stability, 3440, racetrack, 3437
Dent, H. B., amateur communication receiver, 1343 ; long-wave converter, 175
Depackh, D., cable corona in rubber and polyethylene, (A) 2130
Department of Scientific and Industrial Research, radio noise from sun, 1521
D'Eustachio, D., recrystallization of quartz, (A) 3627 ; vacuum valve, 934, (A) 2206
—— and S. B. Brody, multi-crystalline quartz, (A) 3310
—— and S. Greenwald, thermal recrystallization of quartz, 3311
Deutscher, S., with E. G. Wright, electrostatic field mapping, 953
Devitt, W., with others, ground controlled approach, (A) 1528
Dewan, R. N., non-synchronous vibrators, 754
DeWitt, J. H., Jr, radar, 1533, lunar, 2197
Dexter, G., u.h.f. frequency measurement, 1295
Dick, M., m.w. and s.w. transmitters, 3451
Dickenson, T. H., electrets, 950
Dickey, F. P., and H. H. Nielsen, infra-red spectrum of heavy water, (A) 3239
—— with others, h.f. permeability of iron, 90
Dickinson, E. A., with R.O. Strock, Western Electric recording system, 19
Dickinson, T. A., aircraft telemeter system, [illegible]
Dickson, D. C., with C. M. Slack, microsecond radiography, (A) 1613
Dickson, F., determination of v.h.f., 3678
Dickson, G., with P. Hidnert, properties of mica, 1559
Dieke, G. H., and H. M. Crosswhite, spectrochemical analysis, 2266
—— H. Y. Loh and H. M. Crosswhite, spectral intensity measurements, 2274
Dike, S. H., inverse valve voltmeter, 3673
Dinger, J. E., with others, paint-thickness meter, 2260
Dingle, H., Planck's radiation formula, 2865
Dingley, E. N., transmission line theory, (D) 31
Dinsdale, A., post-war broadcasting in U.S.A., 2009
Dippy, R. J., Gee, 1849
Di Roberto, P. P., receiver design considerations, (A) 3401
Distin, L. S., vibratory power converters, 3431
Dobson, G. M. B., A. W. Brewer and B. M. Cwilong, meteorology of lower stratosphere, 3278
Doll, H. G., M. Lebourg and G. K. Miller, mine detector, 1325
Dolph, C. L., optimum current distributions in broadside arrays, 2487
Dorgelo, E. G., sintered glass, 1891
Dorne, A., with others, v.h.f. aerials and d.f. systems, (A) 1448
Dorsey, N. E., Velocity of Light (B), 590, 915
Dorsman, C., pH meter, (A) 674
Dow, J. B., navy radio and electronics, 494, (A) 1613, 2278
Dow, W. G., and others, u.h.f. c.w. power generation, (A) 1715
Downes, J. G., civil aircraft transmitter, 3101
Downing, J. R., and G. Mellen, linear response vacuum gauge, 3616
Drew, R. O., and S. W. Johnson, sound recording tests on colour film, 2806
Dreyer, J. F., Jr, factors determining valve life, 1397
Drukey, D. L., phase-inverter circuit, (D) 1194
Drummond, D. G., preparation of electron-microscope specimens, 395
Drutowski, R. C., with others, precipitation-static aircraft instrumentation, 1992
Dubois, J., d.c. amplifier, 2511
DuBridge, L. A., [illegible] of radar, (A) 1244 ; Radiation Laboratory, M.I.T., 1251
Dubrovsky, V. M., random processes, 1574
Dudley, H., and O. O. Gruenz, Jr, phosphors for visible speech, 3519
Duerdoth, W. T., capacitances of transformer windings, 2499
Duffield, H. W., battle announcing system, 532
Duncan, A. J., with J. G. Smith, Sampling Statistics and Applications (B), 812
Dunlap, O. E., Jr, Radar (B), 2201
Dunn, A. G., adjacent channel interference, 3753
Dunn, H. K., with others, sound spectrograph, 3517
Dunn, R. F., with W. A. Harris, converter tube developments, (A) 1408
Dunoyer, L., thin Al films, 2209, 2210, 2211, 2212
Dunsheath, P., British electrical engineers in war, 415, (A) 729, 921
Dunsmuir, R., with others, cm-wave dielectric measurements, 988, (A) 1915
Duperier, A., cosmic rays, diurnal variations, 3273, geophysical aspect, 593, lunar effects, 3272
—— and M. McCaig, cosmic rays and sunspot activity, 2887
DuPont de Nemours, E. I., & Co., moulded Lucite lenses, 1095
Durand, E., Liénard-Wiechert formulae, 2619
Durkee, A. L., common-channel interference and f.m. broadcasting, 1995
Durnford, A. M. I. A. W., amplifier with diode load, 1478
Dushman, S., and A. H. Young, ionization gauge calibration, 1257
Duvall, G., television receiving aerial sites, 1384
Dwight, H. B., Electric Coils and Conductors (B), 218 ; geometric mean distances for rectangular conductors, 3552 ; toroidal coil self-inductance calculation, 765, (D) 2341
Dyer, J. N., with others, colour television, 451 ; u.h.f. c.w. power generation, (A) 1715
Dyke, F. T., portable film sound recorder, 25

E

Eaglesfield, C.C., carrier-frequency amplifiers, transient response, 68, 1196, 1474, 3205 ; motor-car ignition interference, 3741 ; screened room, 2046
Earle, L. G., soft solders, 2943
East, H. G., and H. Kuhn, bellows manometer, 3427
Easton, A., measuring pulse characteristics, 1599 ; pulse response of diode voltmeters, 1283 ; superregenerative detector selectivity, 1662
Easton, W., voltage stabilization, 3069
Eaton, S., oven for piezoelectric crystals, 3070
Eckersley, T. L., and F. T. Farmer, short-period ionosphere echo fluctuations, 1968
Eckman, D.P., Principles of Industrial Process Control (B), 1958
Eddy, W. C., Television, the Eyes of Tomorrow (B), 2746
Eddy, W. N., and W. D. Fenn, high voltage d.c. testing of rubber-insulated wire, 3668
Eds, A. J., heating and cooling temperature chart, 3241
Edlén, B., solar eruption and cosmic-ray intensity, 3276
Edwards, B. J., postwar television, 455, (D) 2367
Edwards, C. F., microwave converters, (A) 1649
Egan, J. P., and F. M. Wiener, speech intelligibility and frequency distortion, (A) 3525
Ehrat, K., l.f. filters using coils and capacitors, 3201
Ehrenhaft, F., unit magnetic poles, (A) 3247
Ehrlich, R. W., crystal filters, 2164 ; volume expander, 580
Eisenmann, K., self-excitation and regeneration, 881
Eisenstein, A., study of oxide cathodes, 3811
Eisenstein, J. C., with others, effect of altitude on speech and hearing, (A) 3523
Ekstein, H., forced vibrations of piezoelectric crystals, (A) 2156, 3244
Electric & Musical Industries. See E.M.I.
Electron Microscope Society of America, papers in programme, (A) 1317
Electronic Engineering, annual directory, 2610
Electronics, aircraft fuel gauge, 1018 ; arc-furnace regulation, 994 ; artificial radar target, 1542 ; brazing in transmitter valve assembly, 651 ; Buyers' Guide (B), 3489 ; electric fish fence, 1631 ; electronic traffic control apparatus, 131 ; facsimile to moving train, 3088 ; fuel gauge, 1017 ; German industrial techniques, 2927, infra-red military equipment, 2660 ; Harvard electroacoustics laboratory, 1429 ; h.f. aircraft ignition system, 1019 ; machine tool contouring control, 1625 ; microwave relay system, 1055 ; midget c.r.o., 211 ; military loudspeakers, 1439 ; modulated-air acoustic transmitter, 533 ; modulation system for portable transmitter, 2762 ; obstacle locator for the blind, 1309 ; oven for quartz crystals, 759 ; phasitron, 2092 ; photocell weft straightening, 1020 ; radio-controlled aircraft, 1013 ; receiver design, conference, 1978 ; rubber curing, 1617 ; radar, (C) 1248 ; sonar, 2452 ; supersonic strip-tester, 1424 ; thyratron pulse-modulator, 2770
Elias, J. Baltá. See Baltá Elias, J.
Elkin, W. H., with E. D. Hart, welding fine thermocouple wires, 1888
Ellickson, R. T., brightness of phosphors, and wavelength, 2922, 2923 ; infra-red sensitive phosphors, (A) 3622
—— and W. L. Parker, decay of infra-red sensitive phosphors, [illegible]
Ellis, H. D., broadcasting studio equipment, 3422
Ellithorn, H. E., and A. M. Wiggins, noise in differential microphones, 1160
Ellwood, W. B., magnetomotive force gauge, 1583
Elmer, L. A., with others, stereophonic sound-film equipment, 5
Elmer, W. B., tapered-thickness bimetal for thermostats, 757, (D) 2331
Elsasser, W. M., induction effects in geomagnetism, 1834 ; secular geomagnetic variations, (A) 1237
Emde, F., with E. Jahnke, Tables of Functions with Formulae and Curves (B), 2237
E.M.I. Labs., balanced-output amplifiers, 2154 ; cathode-heater insulation protection, 2396 ; polyphase valve supply, 863 ; projection television tubes, 2405 ; resonator frequency stability, 1107
Endall, R., frequency measurements at u.h.f., 3679 ; microwave pulse-time modulation, 2314
Ennes, H. E., mobile relay broadcasting, 3414
Épelboim, I., ferromagnetic cores in a.c. fields, 2609
Epstein, D. W., and L. Pensak, c.r. tubes with metal-backed screens, (A) 1730, 2402
Erhorn, P. C., Nuernberg trials recording system, 2457
Ericsson, T., century of tele-signalling, 3041
Ertaud, A., with others, proton microscope, 2659
Esmarch, W., T. Rommel and K. Benther, supersonic degassing of metal alloys, 392
Espersen, G. A., fine wire in valve manufacture, 1564
Espy, D., coupled circuits, 305
Essen, L., cavity-resonator wavemeters, 1924 ; frequency measurement, survey, 2245
Essen, L., and A.C. Gordon-Smith, frequency measurement, 10^3–10^4 Mc/s, 679, (A) 1923
—— and M. H. Oliver, aerial impedance measurements, 288
Essex, R. B., bicycle receiver, 716 ; bridged-T filters, 1466
Evans, R. J., echo ranging sonar, 3605
Everett, F. C., f.m. station range prediction chart, 736 ; u.h.f. and s.h.f. tuned circuits, 2520
Everhart, E., with others, microwave linear accelerator, (A) 3788
Everitt, W. L., presentation of papers, 497, 1120
Ewald, P., electronic control in chemical industry, 3699
Ewer, D. W., acoustics and flight of bats, (D) 521
Ewing, D., with others, teleran aircraft navigation, 1546

F

Fair, I. E., crystal oscillator theory, (AD) 682
Fairbairn, E. P., f.m. for mobile police, 2750
Fairman, J. F., organization of engineering profession, 499
Fairweather, D., etching and steam treatment of quartz, 1261
Farmer, F. T., with T. L. Eckersley, short-period ionosphere echo fluctuations, 1968
Farnham, R. E., television studio lighting, 3083
Favre, M. G., modulation transformers, 3766
Fearon, R. E., with S. A. Scherbatskoy, e.s. voltmeter for small e.m.fs., 3352
Federal Communications Commission, f.m. tests at 45.5 and 91 Mc/s, (D) 1335
Federici, M., l.f. oscillators, 3217
Feenberg, E., nodal positions and s.w.r. in transmission systems, 3175
Fehlmann, H., and V. Widmer, induction furnace plant, 3375
Feinberg, E. L., e.m. wave propagation along earth, 1962, 3010, 3011, 3012
Feld, B. T., r.f. spectra of diatomic molecules, (A) 3233
Feld, J. N., aerial reciprocity theorem, 1770 ; e.m. theory, boundary problems, 1515, and diffraction, 2548
Feldt, R., cathode-ray Q meter, 671
—— with I. E. Lempert, high-voltage c.r. tube, 3123
Feldtkeller, R., Einführung in die Theorie der Rundfunk-Siebschaltungen (B), 684
Felton, A., with R. S. J. Spilsbury, photocell inspection of cartridge cases, 1016
Fenn, W. D., with W. N. Eddy, high voltage d.c. testing of rubber-insulated wire, 3668
Ferguson, A. J., termination effects in feedback amplifier chains, 3558
Ferguson, J. G., with others, microwave radar testing, (A) 1911, 2645
Ferranti Co., vacuum seal bushing, 1074
Ferrell, E. B., quality control in apparatus life, 804, (D) 2426 ; servomechanisms as amplifiers, 200
Ferrell, O. P., intensity bursts and ionospheric reflection, 1333 ; ionization by meteors, 1520 ; reflection from atmospheric irregularities, 1640 ; sporadic-E effects on propagation, [illegible]
Ferris, W. R., diffraction-grating f.m. detector, (A) 721
Feshbach, H., production of mesons by electrons, (A) 3582
Fett, G. H., wartime training of electrical engineers, 3496
Feuer, P., and E. S. Akeley, scattering in circular waveguide, (A) 3542
Field, R. F., D and Q, 3213 ; interfacial polarization in dielectrics, (A) 3623 ; water films on dielectrics in high humidity, 2933
Field, S., and A. D. Weill, Electroplating, a Survey of Modern Practice, including the Analysis of Solutions (B), 1275
Fielding, E. A., with others, control of electrical twinning in quartz, 1374
Fields, J. L., mobile sound-film recorder, 23
Fink, D. G., colour television, 2363 ; television in America, survey, 223, 779, apparatus and standards, (A) 3445 ; see also D. G. F. under Anon.
Finzi, L. A., electronic overload protection for meters, 1584
Firestone, F. A., supersonic reflectoscope, 822
—— and J. R. Frederick, supersonic reflectoscopy, 3515
Fisher, C. B., phase-inverter circuit, (D) 1194
Fisher, E., sound attenuation in circular ducts, 257, (C) 2113
Fisher, H. J., with others, microwave radar testing, (A) 1911, 2645
Fisher, J. R., with others, bridge photocell, using silicon, (A) 3784
Fisher, S. T., divided-wave amplification, 877, 1475
Fishman, S., limiters as square-wave generators, 3219
Fiske, M. D., bandpass t.r. switch, (A) 3816
Fitch, E., pulse modulation, (D) 3054
Fitzgerald, A. E., Basic Electrical Engineering (B), 2445
Flanagan, M. C., with H. Robinson, thermocouple vacuum gauge, 2919
Fleck, H. R., Plastics : Scientific and Technological (B), 2233
Fleming, C. C., r.f. tests, (A) 2130 ; u.h.f. cable testing, 1597
Fleming, J. A., geomagnetic secular variations and surveys, 2564 ; work of Carnegie Institution, 592
Fletcher, A., J. C. P. Miller and L. Rosenhead, Index of Mathematical Tables (B), 3339, 3660
Fletcher, H., stereophonic sound film system, 4
Flory, L. E., with G. A. Morton, infra-red image tube, 3471
—— with V. K. Zworykin, reading aid for the blind, 3700
Floyd, C. F., with R. A. Brockbank, Unit Bay 1B transmission system, 184, 2000, 3744
Floyd, G. H., with A. R. Koch, transceivers and aerials for 13 cm, 2758
Fluharty, R. G., r.f. cable shielding, (A) 2130
Fluke, J. M., and N. E. Porter, light-wave communication, (A) 1666
Flynn, E. J., and G. W. Young, removing insulation from formex wire, 2930
Fock, V. A., diffraction of waves round earth, 180
Foëx, M., resistivities of rare oxides, 946
Fogel, C. M., ionization vacuum gauge, 2204
Foldy, L. L., and H. Primakoff, electroacoustic transducer theory, 264
Foley, G. M., testing of precision-lathe spindles, 3370
—— with R. W. Dayton, capacitive micrometer, 3369
Foley, W. R., long-range transmission forecasting, 1635
Folland, D. F., microwave blind-landing system, 1866, 2588
Foor, S. W., with others, h.f. permeability of iron, 90
Foot, G. H., graphical symbols for filters, 2094
Foot, N., with W. J. Halligan, receiver tuning system, 2297
Ford, J. R., amplifier circuit, 876
Ford, L. H., c.r.o. pulse duration measurement, 3663
—— and R. Oliver, reflection and absorption of 9-cm waves, 2673
—— with others, half-wave aerial with reflector, (A) 291, (A) 3190
de Forest, L., Television Today and Tomorrow (B), 1097
Forsberg, A. W., with others, exciter-regulator for aircraft alternators, 3064
Forster, E., army receiver R107, 174
Forsyth, J. S. A., with W. Jackson, polythene as h.f. dielectric, (D) 638, (A) 2222
Forsythe, G. E., with others, Dynamic Meteorology (B), 1524
Fortin, R. C., with others, valves for f.m. conversion, (A) 1730
Foster, H. A., valve test panel improvement, 3356
Foster, H. G., anti-aircraft radar, 611
Francis, V. J., and E. G. James, signal and noise rectification, 971
—— with N. R. Campbell, valve and circuit noise, theory, 1087, (A) 2696
—— with others, noise factor of amplifiers, 1191, 1471
Frank, E., Pulsed Linear Networks (B), 582, 1216, 1502 ; RC filter chart, 561
Frank, I. M., Doppler effect in refracting medium, 314
Frank, R., f.m. for amateurs, 1049 ; 112-Mc/s frequency converter, 410
Frankart, W. F., f.m./a.m. receiver, 3084 ; high fidelity t.r.f. tuner, 1982 ; v.h.f. laboratory receiver, [illegible]
Frankel, S., J. J. Glauber and J. Wallenstein, triode for 600 Mc/s, (A) 1730
Franklin, C. W., piezoelectric crystal dimensioning, 683
Frantz, W. J., network response to f.m. waves, 1463
Frayne, J. G., noise-reduction anticipator circuits, 24
—— and F. P. Herrnfeld, f.m. sound-film control track, 272
Frazier, R. H., Elementary Electric Circuit Theory (B), 69, 902
Fredendall, G. L., K. Schlesinger and A. C. Schroeder, television sound transmission on vision carrier, 1382
Frederick, J. R., with F. A. Firestone, supersonic reflectoscopy, 3515
Fredin, C., Svenskradio radiogramophone, 3026, receivers, 1651
Freedman, S., Two-Way Radio (B), 1680
Freehafer, J. E., atmospheric ducts and u.s.w. propagation, (A) 1636
Freeman, G. F., theory of Wheatstone bridge, 1593
Freeman, R. L., and R. C. Hergenrother, high voltage d.c. power supply, 1684
French, D. C., alignment chart construction, 3491
French, N. R., with J. C. Steinberg, portrayal of visible speech, 3516
Frenkel, J., seismoelectric phenomena in soil, 2189 ; theory of atmospheric electricity, 2186 ; theory of terrestrial magnetism, 2896
Frick, C. W., calibration of noise meters, 2248
Friedman, H., with E. der Mateosian, organic vapours for self-quenched G-M counters, (A) 3762
—— with C.O. Muehlhause, high-speed counters, (A) 1469
Friis, H. T., transmission formula, 2282, (D) 3185
Fritsch, V., radio prospecting, 3710
Fröhlich, H., dielectric properties of dipolar solids, 3304
Frondel, C., elastic deficiency and colour of natural smoky quartz, 3309
Frost, P. B., and E. F. H. Gould, telephone interference from power systems, [illegible]
Fu, C. Y., seismic waves, 3565
Fuchs, M., with A. Alford, dipole construction, (A) 1451
Fullam, E. F., and A. E. Gessler, microtome for electron microscope, 1318
Fürstenberg, A. I., incandescent current indicator, 1577
Fürth, R., and D. K. C. MacDonald, statistical analysis of electrical noise, 3411 ; shot effect in diodes, 3126
—— with others, photoelectric Fourier transformer, (A) 656
Furzehill Labs., diode voltmeter, 1589

G

Gabor, D., dynamics of electron beams, 382 ; Electron Microscope (B), 2869 ; energy conversion in electronic devices, (AD) 2384 ; zonally corrected electron lens, 3832
Gadwa, T. A., reactance measurement, 1578
Gaffney, F. J., microwave pulse spectrum analyser, (A) 1576
Gale, A. J., with P. L. F. Jones, supersonic velocity in water, [illegible]

Gall, D. C., electrical micrometer, 384 ; galvanometer amplifier, 373
—— with F. P. J. Ockenden, electrical measuring instruments, 3351
Gallagher, C. J., and J. D. Cobine, hot-cathode arc oscillations, (A) [illegible]
—— with J. D. Cobine, electronic noise source, (A) 3487 ; hot-cathode arc oscillations, (A) 3266
Gans, A. G., permalloy tape for h.f. transformers, (A) 2014, 2225
Gans, E., characteristics of powdered-iron cores, 3434
Gardner, H. A., frequency multiplication for v.h.f., 793
Gardner, K. J., WHFM f.m. converter, 2382
Garity, W. E., and J. N. A. Hawkins, Fantasound multi-speaker system, 6
Garland, L. H., scientific importance of X rays, 1304
Garlick, G. F. J., and M. H. F. Wilkins, phosphorescence, 1808
Garrison, J. B., with others, superconductivity of lead at λ 3 cm, 3258
Garrod, R. I., multiple high-vacuum valve, 3299
Gartlein, C. W., aurora and geomagnetism, (A) 1236
Garton, C. G., capacitors for measurement, (A) 1919
Gautier, T. N., Jr, NBS-ARRL radio observing projects, 1970
Gavin, J., and S. Heytow, home-made 112-Mc/s receiver, 409
Gavin, M. R., interference from industrial apparatus, (AD) 2700
van Geel, W. C., blocking-layer photocells, 3785
Geffcken, H., and H. Richter, Die Photozelle in der Technik (B), 784
Geist, J. C., a.m./f.m. transmitter, 788
Gemant, A., induction heating, 1614
—— and J. Sticher, crucible failure in induction heating, 695
General Electric Co. (U.S.A.), developments in electronics and radio, 1941, in plastics, 1893
Génin, G., dielectric heating, 698
George, D. E., with others, detection of rapidly moving ionospheric clouds, 3279
George, L., with H. Gordon, v.h.f. receiver selectivity measurement, 2621
George, W. D., M. C. Selby and R. Scolnik, quartz crystal units, (A) 1576
Georgiev, A. M., Electrolytic Capacitor (B), 443
Gerber, W., and A. Werthmüller, electric heater hum, 1996
Gershun, A., light field in scattering medium, 2868
Gerszonowicz, S., Galvanómetros y Oscilógrafos (B), 689
Geschwinde, —., impedance matching charts, 865
Gessler, A. E., with E. F. Fullam, microtome for electron microscope, 1319
Geylikman, B. T., theory of ferromagnetism, 2178
Ghirardi, A. A., a.f.c. in receivers, 2684 ; counteracting frequency drift, 1342, 1645, 1646 ; frequency conversion in receivers, 2692 ; multigrid mixers and converters, 3408 ; push-button tuners, 772
Giacoletto, L. J., resonant cavities, 2847
Gibello, H., Résines Vinyliques (B), 3649
Gibson, D. L., and C. H. Braithwaite, quality control of insulating varnishes, 101
Gibson, P. R. S., plastics in electrical industry, 3643
Gilbert, P. T., corrosion measurements, 808
Gill, P. S., mesotron intensity *vs* altitude, 2877
Gillespie, C. N., compensating amplifier, 1712
Ginsburg, V. L., geomagnetism and ionospheric reflection, 1026 ; ionosphere, absorption theory, 2287, refractive index, 2901 ; superconductors, theory, 2541, thermoelectric phenomena, 2176
—— with Ya.L. Al'pert, absorption of radio waves in ionosphere, 3007
Ginston, E. L., stabilized negative impedances, 54
—— and A. E. Harrison, reflex klystron oscillators, 1734, (C) 2080
Gittoes, C. S., with others, equipment deterioration in tropics, 809
Given, K. W., with others, development in design engineering, 2096, materials, 1558
Gladenbeck, F., Jahrbuch des elektrischen Fernmeldewesens (B), 747
Gladwin, A. S., pulse modulation, 3752
Glauber, J. J., with others, triode for 600 Mc/s, (A) 1730
Gleason, C. H., and C. Beckman, pulse response of thyratron circuits, [redacted]
Gleissberg, W., sunspot cycle, next maximum, 324, and propagation, 2284, secular variations, 1830
Glinski, G., aerial gain measurements, 287 ; transmission lines, attenuating problems, 1173, discontinuity effects, 1174, matching problems, 2837
Glover, A. M., and A. R. Moore, photocell for sound on colour film, 3076
Gnevishev, M. N., and A. I. Ol, solid angle of corpuscular radiation, 2555
Goddard, L. S., optics of electrostatic lens, 2998, Petzval field curvature, 2999
Goddard, M. J., with P. Nagy, time-base converter and frequency-divider, 3826
Goffman, C., and J. Manuele, preparation of specifications, 3146
—— with J. Manuele, quality control, 503, (D) 2425
Gogoladze, V., Rayleigh boundary waves, 2863 ; reflection and refraction of elastic waves, 2862, 2864
Golay, M. J. E., lag line as low-pass filter, 1497
Goldberg, A. A., u.h.f. frequency meter, 1594
Goldberg, H., internal impedance of cathode follower, 42
Golde, R. H., lightning to transmission lines, 2335
Goldman, A., radar altimeter, 2587
Goldman, I. M., with B. M. Wul, permittivity of barium titanate, [redacted]
Goldmark, P. C., colour television, 227, (A) 1708, (A) 3087 ; television at u.h.f., (A) 1704
—— and others, colour television, 451, 452
Goldsmith, T. T., interference with television, 3097
—— with N. Levinson, Vitasound sound film reproduction, 3
Goldstein, H., microwave scattering at sea surface, (A) 3718
—— and P. D. Bales, c.r.o. photography, 1698
Goldstine, H. E., with others, comparison of frequency-shift and on-off keying, 2306
Golubkoff, P., theory of u.h.f. oscillators, 2775
Good, W. E., absorption lines of ammonia, 3236
Goodell, E. M., uses of microwave triodes, (A) 1730
Goodell, J. D., and D. J. Coleman, electronics in aviation, 1628
—— and B. M. H. Michel, auditory perception, 2797
Gooden, J. S., with others, pulse technique for particle acceleration, 2997
Goodman, B., amateur-band receiver, 3030, transmitter, 786 ; bandpass 28-Mc/s converter, 1661, 1987 ; grain structure of semiconductors, (A) 3638 ; superheterodyne 144-Mc/s receiver, 411
—— with P. H. Miller, Jr, optical microwave detector, (A) 3409
—— with others, h.f. rectification efficiency of crystal detectors, (A) 3636
Goodman, D., 2MV X-ray equipment, 1622
Gootée, T., lunar radar, 2197
Gordon, H., and L. George, v.h.f. receiver selectivity measurement, 2621
Gordon, J. F., angular-velocity-modulation system, (A) 1666, 2763
Gordon-Smith, A. C., with L. Essen, frequency measurement, 10^3-10^4 Mc/s, 679, (A) 1923
Gorelik, G. S., nonlinear phenomena in superposed magnetic fields, 2878
—— with A. Andronov, resonance phenomena in cyclotron, 2885
Gorham, J. E., with others, vacuum-contained triode transmitter, 1403
Gorman, L. J., corrosion of underground cables, 510
Goroshankin, B. N., with Ya.L. Al'pert, coastal refraction, 161 ; ionosphere and solar eclipses, 2892, 1945 eclipse, 2893
Gorton, W. S., demountable soundproof rooms, 825, 1753, 2118
Goudet, G., developments in magnetron technique, 2780
Gould, E. F. H., with P. B. Frost, telephone interference from power systems, 3046
Gould, L., sonicator, position finder, 3164
de Gouvenain, A., pulse technique, 3754
Graf, A. W., patent commission, (A) 2418
Graham, R. E., linear servo-theory, (A) 1700
—— and F. W. Reynolds, synthesis and evaluation of television images, 1090
Grammer, G., noise limiting in c.w. reception, 2302 ; stabilization of 144-Mc/s transmitter, 2062
Granbois, K. J., with C. M. Sherer, corrosion of lead cable sheaths, 511
Granier, J. & G., dielectric loss of liquid semiconductors, 1882
Granovsky, V. L. (B. L.), gas discharge, small perturbations, 1224, theory, 1510 ; plasma disintegration, 1812
—— and L. N. Bykhovskaya, oscillations of low-pressure Hg arc, [redacted]
—— and T. A. Suetin, high-power plasma oscillations, 2872
Grant, R. M. W., class B modulator design, 310, 3221
Gratzmuller, A. M., with M. Kuhner, reflection klystrons, 2776
Greanias, E. C., with H. F. Kaiser, synchro-betatron, 3786
Green, B., with others, ground controlled approach, (A) 1528
Green, E., phase and frequency modulation, 1347
—— with V. J. Cooper, design of directional aerials, 36
Green, E. I., H. J. Fisher and J. G. Ferguson, microwave radar testing, (A) 1911, 2645
Green, H. C., with G. A. Kopp, phonetic principles of visible speech, 3518
Greenblatt, M. H., P. H. Miller, Jr, and L. I. Schiff, electrical contact noise, 3263
Greenfield, E. W., h.f. twin cable, design, (A) 2130
Greenland, K. M., high-reflection optical films, 1556
Greenlee, L. E., electronic organ, 3391
—— with R. E. Campbell, photo-electronic organ, 2668
Greenstein, J. L., L. G. Henyey and P. C. Keenan, interstellar origin of cosmic noise, 3271
Greenwald, S., with D. D'Eustachio, thermal recrystallization of quartz, 3311
Greer, W. R., pulse modulating system, 3421
Gregory, J. H., with others, r.f. resistance of iron wire and permalloy strip, 1266
Gregory, L., tone correction, 2533
Greibach, E. H., testing bone and throat microphones, (A) 1754, 2121
—— and L. G. Pacent, inertia throat microphones, (A) 1754, 2122
Greig, J., post-graduate engineering, (D) 2435 ; training in radio industry, (D) 1128
de Greve. See De Greve
Griaule, M., aviation and scientific research, 3132
Grieg, D. D., multiplex broadcasting, 3049
Griffin, D. A., frequency deviation reception, 3736
—— and L. C. Waller, audio-modulated detection, 2694, 3035
Griffiths, A. E., power and directivity of KOTA, 1057
Grignon, L. D., three-band variable equalizer, 1170
Grivet, P., u.h.f. technique, 3264
—— with H. Bruck, electrostatic electron microscope, 3706
Grodzinski, P., Diamond Tools (B), 1884
Gronner, A., forces between electrons in parallel motion, 3253
Gross, E. E., coaxial butterfly circuit, (A) 883, (A) 1209, 1797; power pack, 2733
Grosskopf, J., and K. Vogt, polarized radiation, (A) 1330
Grove, D. J., with others, electronics of mass spectrograph, 132
Grover, T., and E. C. Kluender, merchant-ship radar, 3292
Gruens, O. O., Jr, with H. Dudley, phosphors for visible speech, 3519
Grumel, H., transmitting equipment for merchant navy, 3805
—— and P. Morel, mine detection, 3712
Grummitt, O., with R. E. Burk, Major Instruments of Science and their Applications to Chemistry (B), 1633
Grünberg, G. A., coastal refraction, 2672 ; current in multielectrode valves, 1109
Guanella, G., impedance matching in r.f. circuits, 3200 ; technical applications of filters, 873
Guarrera, J. J., tunable coaxial resonators, 1482
Gubar, S., and I. Kikoin, temperature/resistance relation for Hg, 1877
Guénard, P., e.s. focusing in velocity-modulated valves, (C) 3475
Guerbilsky, A., theory of quadripoles, 3202
Guérineau, M., Monobloc s.w. transmitter, 3455
Guggenheim, E. A., magnetic energy, 1227
Gunn, D. W., servicing f.m. receivers, 2689
Gunn, R., W. C. Hall and G. D. Kinzer, precipitation-static problems, 1991
—— and J. P. Parker, h.v. characteristics of aircraft in flight, 2323
—— with others, electrification of aircraft, 1993
Gunning, W. F., with E. G. Van Leeuwen, strain gauges, 2262
Gunn-Russell, C., with others, portable precision amplifier-detector, 2644
Gurevich (Gurewitsch), A. M., cavity oscillator circuits, 1483
—— and P. C. Noble, stabilized d.c. high-voltage supply, 1366
Gurevich, L. E., absorption of h.f. sound in metals, 2448
—— and A. I. Lebedinsky, magnetic field of sunspots, 2890
Gustin, W., with others, Dynamic Meteorology (B), 1524
Guth, E., with H. M. James, equations for elastic vibrations, 312
Güttinger, P., mutual effect of two f.m. waves in limiters, 3399
Gutton, C., electrolytic polishing, 2226
Gvosdover, G., h.f. currents in valves, (A) 2389

H

Haas, F., valve voltmeters, 3674
Hadfield, B. M., feedback amplifier, (A) 1472, (A) 1496
Hadley, P. T., A. W. Forsberg and O. Krauer, exciter-regulator for aircraft alternators, 3064
Hadlock, C. F., 2-m crystal-controlled converter, 2296
—— and R. S. Hawkins, crystal-controlled 150-Mc/s transmitter, 2756
Haefner, S. J., amplifier-gain formulae and measurements, 2841 ; dynamic characteristics of pentodes, 2846
Hägg, G., and T. Laurent, machine for summation of Fourier series, 2957
Hahm, W., film sound-recording methods, 831
Hainer, R. M., G. W. King and P. C. Gross, microwave absorption of water vapour, (A) 3235
Haines, D. G., interval timer, 3068
Haines, F. M., gramophone bass compensation, 883, (C) 1762
Haist, C. T., Jr, Tiny Tim transceiver, 2063
Hale, N. H., with R. W. May, automatic position control mechanisms, 1374
Hall, H. D., with A. L. Quirk, a.c. null indicator, 672
Hall, J. A., photocell selector, 1697
Hall, T. W., Trans-Canada v.h.f. f.m. system, 191
Hall, W. C., with others, precipitation-static problems, 1991
Halligan, W. J., and N. Foot, receiver tuning system, 2297
Hallman, L. B., Jr, with R. D. Hultgren, radar beacon, (A) 1523
Hallows, R. W., Radar – Radiolocation Simply Explained (B), 2902, 2916 ; television standards, 225
Halmshaw, R., gamma radiography technique, 2594
Halpern, J., and others, microwave linear accelerator, (A) 3788
—— with others, superconductivity of lead at λ 3 cm, 3258
Halsey, R. J., repeaters for submarine telephony, (D) 540
Halstead, W. S., f.m. railway communication system, 2325, 2710
Hamermesh, B., with S. A. Korff, cosmic-ray radiosonde techniques, 2986
Hamilton, C. E., and T. Maiman, voltage regulated power supplies, 756, 1076, 1688
Hamilton, G. M., dissolution of cable sheathing alloys, 2947
Hamsher, D. H., testing paraboloid reflectors, 2866
Hamtil, C. N., resistance of compressed rocksalt, (A) 1557
Hancest, E., h.v. lines for carrier-current communication, 3417
von Handel, P., and K. Kruger, Funknavigation in der Luftfahrt (B), 628
Hannum, E. L., Jr, remote tuning for receivers, 1840
Hanopol, L. Y., production tester for small capacitances, 124
Hansel, C. W., directive aerial, 290
Hansell, C. W., diversity system, (A) 1663 ; pulse modulation, (A) 739 ; ratio-controlled amplifier valve, (A) 1407
Hansell, G. E., with others, comparison of frequency-shift and on-off keying, 2306
Hansen, E., selsyns, 1702
Hansen, W. W., gain—bandwidth product in amplifiers, (C) 1468
Harang, L., annual variation of critical frequencies, Tromsö, 2571 ; ionospheric echoes during 1945 eclipse at Tromsö, 599 ; ionospheric scattering, 597
Hargrove, B. E., converter-receiver, 1652
Harris, C. M., acoustic absorption of patch of material, 826
Harris, E., remote control for rotating array, 3191
Harris, H., Jr, frequency response of automatic control systems, 1764
Harris, L. D., a.c. mains voltage regulator, 1365
Harris, W. A., and R. F. Dunn, converter tube developments, (A) 1406
Harrison, A. E., with E. L. Ginzton, reflex klystron oscillators, 1734, (C) 2060
—— with R. Merchant, portable 5300-Mc/s transmitter-receiver, 1100
Harrison, C. W., quartz crystal measurement, (A) 1296
Harrison, C. W., Jr, aerial arrays, symmetrical, 854, 3-element broadside, theory, 1774, unsymmetrical, current distribution, 853
Harrison, E. B., high-quality transformers, 201
Hart, E. D., construction and operation of klystrons, 3474 ; radar for merchant ships, 3612
—— and W. H. Elkin, welding fine thermocouple wires, 1886
Hart, L. P., Jr, quality control of insulating varnishes, 1883
Hartridge, H., acoustics and flight of bats, 258, (D) 521
Hartshorn, L., radio-frequency heating, [illegible]
—— and W. Wilson, moisture meter, 388, (A) 993, 2653
Hasler, A. D., with L. V. Whitney, photoelectric fish counter, [illegible]
Hasselbacher, H. H., railway communications, 1062
Hassell, F., and F. Jenks, electroforming, 1563
Hastings, A. E., RC parallel-T network, 1464
Hathaway, C. M., strain gauge equipment, 694
Hauck, V. D., J. R. Cosby and A. B. Dember, radiosonde, 2280
—— R. E. Sturm and R. B. Colt, recorder-controller for temperature and humidity, 3371
Hauser, L., signal generator, 1606
Hausz, W., f.m. gramophone pickup, (A) 1152
Hawkins, J. N. A., with W. E. Garity, Fantasound multi-speaker system, 6
Hawkins, R. S., with C. F. Hadlock, crystal-controlled 150-Mc/s transmitter, 2756
Hawkins, W. G., noise figures of receivers, 1665
Haworth, J. E., tapped inductor circuit, 3561
Hayman, W. H., electronic comparator gauge, 2891
Haynes, H. E., integrating voltmeter, 1587
Haznadaroff, B., infra-red varnish drying, 699
Healy, C. P., radio equipment in tropics, 3502
Hearmon, R. F. S., vibration frequency of wood plates, 1146, (D) 3158
Heath, F., and A. L. Hetherington, Industrial Research and Development (B), 3154
Hector, L. G., proximity fuse, 2667
—— and D. L. Woernley, permittivities of various gases, 1894
Heden, N., century of telegraphy and telephony, 3042
Heidemann, E., Grundlagen und Ergebnisse der Ultraschallforschung (B), 843
Heidenreich, R. D., with R. F. Boyer, molecular weight of high polymers, 351
Heins, H., hydrogen thyratrons, 3117
Heising, R. A., (Ed.), Quartz Crystals (B), 2951
Heisler, M. P., with V. Paschkis, electrical analogy to heat flow, 2429
Heisner, D. A., ship-to-shore radiotelephone system, 1670
Heitler, W., Elementary Wave Mechanics (B), 1234
Held, F., with H. Stäger, h.f. hardening of plastics, 1001, 3696
Hellmann, R. K., acoustic-response curve tracer, 527
Helt, S., broadcast engineers conference, (A) 2365
Henderson, F. E., German capacitor construction, 2723
Henderson, S. T., with J. W. Strange, cathodo-luminescence, 3240
Hendricks, W. C., AN/TPS-3 radar, 1536
Hendrickson, G., dual-rocket aerials, 3159
Henkler, O., and R. Otto, amplitude and phase modulation, physical basis, 3461
Henneberger, T. C., exploring coils, 2336
Henney, K., Principles of Radio (B), 2446 ; see also K.H. under Anon.
Henry, D. S., v.h.f. impedance measurements, 977
Henry, E. A., drivers for class B amplifiers, 262
Henyey, L. G., with others, interstellar origin of cosmic noise, 3271
Herbert, G., hermetic sealing, 811 ; selenium rectifiers, 1363
Herbst, P. J., and others, teleran aircraft navigation, 1546
Hergenrother, R. C., with R. L. Freeman, high voltage d.c. power supply, 1684
Herlin, M. A., and S. C. Brown, u.h.f. gaseous discharge, (A) 3574
Herold, E. W., bridge null indicator, 123 ; local-oscillator interference with television, 2303 ; superheterodyne conversion, 1985
Heron, K. M., with P. A. Marchant, Post Office radar equipment, 1540
Herrmann, D. B., with J. Leutritz, Jr, tropical insulation of plastics, 1562
Herrnfeld, F. P., with J. G. Frayne, f.m. sound-film control track, 272
Hers, J., broadcasting station frequency measurement, 2946
Hershberger, W. D., microwave absorption in gases, (A) 1336, 3234, (A) 3585 ; radio echoes from planets, 2585
—— with J. E. Walter, microwave absorption in gases, (A) 3584
—— with others, pulse altimeter, (A) 1528
Herwald, S. W., with others, electrical analogy for servomechanisms, 1362
Hetherington, A. L., with F. Heath, Industrial Research and Development (B), 3154
Hey, J. S., solar noise, 1825
—— S. J. Parsons and J. W. Phillips, r.f. cosmic-ray fluctuations, 3599
—— J. W. Phillips and S. J. Parsons, cosmic noise at 64 Mc/s, 3270
Heytow, S., signal shifter, 1720
—— with J. Gavin, home-made 112-Mc/s receiver, 409
Hibberd, R. G., television signal generator, 2255, 2646, 2980
Hickam, W. M., with others, electronics of mass spectrograph, 132
Hickernell, L. F., and C. J. Snyder, lead alloy for cable sheathing, 3647
Hickman, A. T., pulse width modulation, 1800
Hickson, P., marine loudspeaking gear, 3536
Hidnert, P., and G. Dickson, properties of mica, 1559
Higgins, T. J., temperature distribution in transformer cores, 202
—— with H. P. Messinger, inductance of coaxial busbars, 2815
Higgins, W. H. C., with W. C. Tinus, naval fire-control radar, 2581
Higham, J. B., high voltage c.r.o., (A) 1090
Hill, A. G., with others, f.m. for physical measurements, (A) 3247
Hill, C.G.A., characteristics of phosphors, (D) 104, 649 ; uniform luminescent materials, 1571
Hill, L. R., with others, silicone insulating materials, 98
Hill, R. D., potential of equal coaxial cylinders, 317
Hill, W. R., Jr, current stabilizer, circuit analysis, 48
Hilliard, J. K., beam power valves and triodes, for driving loudspeakers, 1166, intermodulation tests, 2043 ; intermodulation tests of a.f. amplifiers, 2978
—— with J. B. Lansing, two-way theatre loudspeaker, 530
Hilliard, R. C., gas discharge tubes, 1729
Hillier, J., electron microscopes, lens distortion, 3381, resolving power, 1947
—— and R. F. Baker, resolution of electron diffraction cameras, 1314
—— and E. G. Ramberg, defects in electron microscope objectives, (A) 3385
—— with others, Electron Optics and Electron Microscope (B), 1960, 2358
Hinman, W. S., Jr, and C. Brunetti, radio proximity fuse design, 3713
von Hippel, A., J. H. Schulman and E. S. Rittner, electrolytic selenium photocell, 2034
—— and others, photo behaviour of thallous sulphide, (A) 3624
Hipple, J. A., D. J. Grove and W. M. Hickam, electronics of mass spectrograph, 132
Hird, F. S., cable-splice detector, 148, 387
Ho, T. L., and W. S. Lung, variation of light path with frequency, 3231
Hoadley, J. C., audio oscillators, 3169 ; hum elimination, 1476
Hobbs, M., Japanese magnetrons, 2369
Hoder, L., scientific method in engineering, 1408
Hoffman, B., tensors and equivalent circuits, (D) 1896
Hoffman, W. B., with J. Cramer, Radio Sound Effects (B), 1444
van Hofweegen, J. M., impedance measurement at dm wavelengths, 1916
Hoisington, W. F., 420-Mc/s transmitter and receiver, 2757

Holdam, J. V., S. McGrath and A. D. Cole, blind bombing radar, 2196, 2579
Holden, A. N., growing single crystals from solution, (A) 1263
Holden, T. W. W., narrow band communication system, (A) 1996
Hole, N., statistics in counter technique, 3336
Holliday, F., selection of engineering staff, 3505
Holloway, D., Canadian broadcasting policy, 1355
Holloway, F. L., R. P. Burrows and J. E. Keto, airborne radar equipment, (A) 1528
Hollywood, J. M., with others, colour television, 451, 452
Holmbe, J., G. E. Forsythe and W. Gustin, Dynamic Meteorology (B), 1524
Holmbeck, J., crystal control in 21, 50 and 144 Mc/s bands, 472
Holmes, L. C., magnetic wire recording, (A) 836, (A) 1164
Holmquest, H. J., with S. L. Osborne, Technic of Electrotherapy and its Physical and Physiological Basis (B), 1021
Holmqvist, S., d.c. potentiometers, 2972
Holstein, T., h.f. gas discharge, (A) 1726; t.r. switch spike, theory, (A) 3815
Holt, G. K., with D. W. Bloser, timer for aircraft de-icer, 704
Holter, N. J., sea-wave measurement, 2265
Holtz, R. F., super turnstile aerial, (A) 2143
Honnell, M. A., single-sideband generator, 389
Honnell, P. M., logarithmic frequency scale, 965; measurement of transformer turns-ratio, 263
—— and W. E. Strohm, laboratory for basic electronics, 1416
Honnor, W. W., atmospheric conditions and aircraft radio, 3143
—— and J. P. Blom, military aircraft transmitter-receiver, 3023
Hooke, A. H., measurement of grid primary emission, 1598
Hookham, G., tensions in hanging wires, 2808
Hooton, H. D., r.f. amplifier, 2753, 3464
Hopkins, H. G., with R. L. Smith-Rose, u.h.f. d.f. for radiosonde, 1864
Hopper, F. L., and R. C. Moody, outdoor sound propagation, 1423
Horecker, B. L., with H. L. Andrews, colorimeter for blood analysis, 987
Horner, F., and others, cm-wave dielectric measurements, 966, (A) 1915
Horner, W. F., and F. R. Koppa, tropical treatment of military equipment, 519
Horton, H. L., electronic control, machine tools, 2259, resistance welding, 2258; electronic measurement of physical properties, 2263; r.f. heating in engineering, 2269
Horvath, W. J., with H. P. Iskenderian, heating of multiconductor cables, 1767
Horwood, H., impedance calculations, 2828
Hoselitz, K., hard magnetic materials, 2607
Houghton, R. W., 50-Mc/s frequency converter, 2693
Houldin, J. E., with others, u.h.f. radio measurements, 1914, (A) 2963
Houstoun, R. A., and A. F. Howatson, selenium barrier-layer photocells, 214
Howard, W. A., portable video pickup equipment, 3802
Howatson, A. F., with R. A. Houstoun, selenium barrier-layer photocells, 214
Howe, G. W. O. See G.W.O.H. under Anon.
Howes, D. E., high-impedance pulse voltmeter, 376
Hoyler, C. N., with others, r.f. drying of penicillin, 1308
Hubbell, R., Television Programming and Production (B), 785, 1713; television studios, 1706
Hubel, J. E., fire and police radio, 1678
Huber, J., television signal distortion in valve circuits, 901, 3228
Hudgins, C. V., with others, frequency characteristics for hearing aids, (A) 3538
Hudson, P. K., graphical solution of series circuits, 1788
Hudson, R. G., Electronics (B), 253
Hudspeth, E. L., waveguide as particle accelerator, 3789
Hughes, D. H., band-spread tuners, 1803; broadcast receiver circuits, (A) 2856
Hughes, H. A., number of observations for given accuracy, 3335
Hull, A. W., research and the community, 254
Hulstede, G. E., and others, u.h.f. receivers, (A) 1649
Hultgren, R. D., and L. B. Hallman, Jr, radar beacon, (A) 1528
Humby, S. R., Electricity and Magnetism for Students (B), 2886
Humphreys, O. W., with others, radiant and h.f. heating, 145, (A) 896, (D) 2268
Humphreys, L. D., and A. W. Stannett, dipole theory of dielectrics, 586
Hunt, G. J., radio reference library, 2408
Hunt, J. W., science librarianship, 3488
Hunt, L. B., and H. G. Taylor, electrical contact springs, (D) 3061
Hunter, D., automatic programme fader, 65
Hunter, L. P., with others, probe error in waveguide standing-wave detectors, 981
Hunter, P. H., cathode biased amplifiers, 566; electronic micrometers, 3686; phase sensitive a.c. bridge detector, 2635
Hunter, T. A., permeability-tuned oscillators, 3103
Huntoon, R. D., and B. J. Miller, proximity fuse, 624
Husbands, A. S., gas pressure control in discharge tubes, 3300
Hutchison, T. S., and J. Reekie, magnetic susceptibility measurement, 3664
Hutter, R. G. E., electrostatic electron lens, analysis, 1003, satisfying Newton's image relation, 1004

I

Induni, G., quadruple-beam c.r.o., 2338, 3772
Ingram, S. B., recent valve developments, 247
Institute of Radio Engineers, proposed R.M.A. standards, 2101; radio progress during 1945, 2100; winter technical meeting, abstracts of papers, 1431, 1448, 1482, 1528, 1576, 1613, 1636, 1649, 1666, 1700, 1704, 1715, 1730, 1772, 1979, 2034, 2069, 2078
Institution of Electrical Engineers, engineers' education and training, 1125
Isaac, L. B., theatre television, (A) 3067
Isenburger, H. R., Bibliography on Industrial Radiology (B), 1227
Iskenderian, H. P., and W. J. Horvath, heating of multiconductor cables, 1767
van Itterbeek, A., and L. De Greve, resistivity of thin Ni film, 343, 3305
Ivers, J., CAA Alaskan diversity receiving system, 1669, 2002
Ives, H. E., Lorentz transformation derivation, 1217

J

Jackson, C. E., airborne teletype communication system, 1354; booster amplifier, 3559
Jackson, J. S., parasitic oscillations in transmitters, 1714
Jackson, W., High Frequency Transmission Lines (B), 298; post-graduate engineering, (D) 2435
—— and J. S. A. Forsyth, polythene as h.f. dielectric, (D) 638, (A) 2222
—— and W. Reddish, high permittivity crystalline aggregates, 622
—— with others, cm-wave dielectric measurements, 966, (A) 1915
Jacobsmeyer, V. P., photoelectric effect of films, (A) 1504
Jacobson, E. R., electronic counter, 2147
Jacquet, P. A., electrolytic polishing of Al and alloys, 648
Jaederholm, H. W., iron powder cores and coils, 1081
Jaeger, J. C., diffusion in ionosphere, 598; switching problems and instantaneous impulses, 3550
Jaffe, D. L., r.f. amplifier stability factors, 2528; mains frequency doubler, 2351; tone control circuit, 1760
Jaffe, H., piezoelectric figures of merit, (A) 1964
Jager, F., telemetering of measurements, 3348
Jahnke, E., and F. Emde, Tables of Functions with Formulae and Curves (B), 2237
James, E. G., with V. J. Francis, signal and noise rectification, 971
—— with R. F. Proctor, r.f. capacitance and conductance bridge, 676, (A) 1592
—— with others, noise factor of amplifiers, 1191, 1471
James, H. M., and E. Guth, equations for elastic vibrations, 312
Jamieson, H. W., and J. R. Whinnery, power amplifiers with disk-seal valves, 2855
Jarvis, G. A., positive ions from thoriated tungsten, (A) 3466
Jay, A., f.m. frequency allocation, 733
Jefferson, H., preferred numbers and filter design, 299, 871, (D) [illegible]
Jeffery, C. N., analysis of cathode follower, (A) 565
Jelonek, Z., thermostat theory, 1689
Jenkins, H. G., fluorescent lamps, 517
Jenks, F., with F. Hassell, electroforming, 1563
Jenks, F. A., microwave techniques, 185
Jenny, F., transmitting valves, production, 3481
Jensen, R. C., and R. A. Arnett, airborne radar in peacetime, 2580
—— with R. A. Arnett, navigation and obstacle-detection radar, (A) 1847
van Jepmond, H. K., telephone amplifier, 1473
Jernstedt, G. W., protective coatings on metal, 942
Jervis, A. E. L., h.f. heating for moulding plastics, 394; silicones, 2931
Jesty, L. C., colour television, (D) 780
Jofeh, L., operational calculus, 3650
Joffe, M., with M. Apstein, LC circuit for 140-450 Mc/s oscillator, 1484
Johannson, O. K., and J. J. Torok, silicones for water-repellent surfaces, 2214
Johnson, D. C., reduction of galvanometer time constant, 2630
Johnson, N. K., meteorological methods, 2988; wind measurements at 30 km height, 919
Johnson, P., transmitter remote control, 2353
Johnson, R. N., interference in f.m. receivers, 172
Johnson, S. W., with R. O. Drew, sound recording tests on colour film, [illegible]
Johnson, V. A., and K. Lark-Horovitz, thermoelectric power in germanium, 2216
—— R. N. Smith and H. J. Yearian, d.c. characteristics of crystal rectifiers, (A) 3630
—— with K. Lark-Horovitz, resistivity in germanium alloys, 2216
Jones, A. A., heterodyne frequency meter, 2974
Jones, C. R., slotted tubular aerial, 2823
Jones, F. C., crossover filters for dual loudspeakers, 1436; parallel-tube fidelity amplifier, 263, 2464
Jones, F. E., Oboe, 1849
Jones, F. Llewellyn, spark discharge, and electrode evaporation, 3436, stepped breakdown, 2870, tungsten oxide films, 1886
Jones, K. I., and D. A. Bell, u.h.f. and post-war broadcasting, 424
Jones, L. F., with others, teleran aircraft navigation, 1546
Jones, P. L. F., and A. J. Gale, supersonic velocity in water, 2449
Jones, R. Clark, dielectric ellipsoid in inhomogeneous field, (C) 907; driving-point impedance of an infinite solid plate, 2114
Jones, W. J., microwave wavemeters, 1595
Jonker, J. L. H., current to positive grid in valves, 2087
—— and B. D. H. Tellegen, current to positive grid in valves, 2087
Jordan, E. C., with others, model aircraft aerial measurements, (A) 1448
Josephs, H. J., Heaviside's Electric Circuit Theory (B), 2535
Jouguet, M., curved waveguides, 2469
Joyce, L. S., thyratron visual tuning indicator, 2348
Joyce, R. C., tropic-proof components in Malaya, 426
Jupe, J. H., electronic crack detector, 134; moisture meter, 2653; radar buoy, 3615

K

Kahan, T., cavity resonators, semi-transparent, 1795, thermodynamics, 2521
Kahn, L., with N. Lazareff, obtaining high pressures at low temperatures, 2595
Kahn, M. B., and S. L. Sack, f.m. transmitter, 2064
Kaiser, H. F., and E. C. Greanias, synchro-betatron, 3786
Kalabuchov, N., photoconductivity of alkali-halide crystals, 1817
Kallmann, H. E., nonlinear circuit element applications, 3554
Kalmus, H. P., gramophone pickup, 1154, circuit, 2795
Kammer, E. W., l.f. signal reference for strain recording, 1479
Kandoian, A. G., coaxial-fed loop aerials, 2481; f.m. broadcast loops, (A) 2143; u.h.f. aerials, 1180, 2824
—— with others, aircraft u.h.f. course indicator, 932
Kaptsoff (Kaptsov), N. A., corona discharge and mobility of negative ions, (A) 1814; negative ions in strong electric field, 3578
Kasakevitch, V. V. See Kazakevich
Kasner, E., and J. De Cicco, Laplace equation transformation, 360
Katz, L., with C. J. Marshall, television equipment for guided missiles, 2739
Katzin, M., and R. W. Bauchman, u.s.w. propagation in low level ducts, (A) 1636
Kauffman, H., lunar radar, 2197
Kaufman, A. B., aircraft transmitter, 1717; miniature 'phone transmitter, 3454
—— and E. N. Kaufman, carbon gramophone pickup, 3161
Kaufman, E. N., with A. B. Kaufman, carbon gramophone pickup, 3161
Kauke, J. E., velocity modulation, 2391
Kauppi, T. A., and G. L. Moses, silicone insulating materials, 99
Kazakevich (Kasakevitch), V. V., integration of van der Pol's equation, 2834; oscillatory systems with one degree of freedom, 3230
Ke, T. S., and L. D. Smullin, t.r. switches, (A) 3814
Keenan, P. C., with others, interstellar origin of cosmic noise, 3371
Kees, A. A., recording in aircraft, 2803
Kell, R. D., and G. C. Sziklai, image orthicon camera, 2374
Kelleher, J. J., pulse-modulated radio relay equipment, 2315
Kelley, R. R., feeder impedance calculation, 3549
Kelliher, M. G., and E. T. S. Walton, spark-generated cm waves, 1101
Kellogg, J. M. B., with others, microwave absorption in water vapour, (A) 3719
Kelvin, W., field of unbalanced dipole, 2822
Kemp, J., anomalous attenuation in waveguides, 2818, (C) 3540
Kempner, S., recordgraph embossing recorder, 2462
Kemppainen, A. O., with M. Newman, h.v. installation for lightning investigations, 2344
Kendall, D. G., Planck's radiation formula, 2885
Kendell, E. M., receiver loop aerial design factors, 554
Kenyon, R. W., loran, principles, 1943; network design with electrolytic tanks, 1470
Kern, R. E., with S. B. Williams, stress measurement, (A) 1933
Kerr, R., with R. M. Angles, corrosion resistance of Sn-Zn alloys, 2599
Kerst, D. W., betatron, historical development, 1083; particle acceleration, (D) 2036
—— with others, removal of electron beam from betatron, 3439
Kessenikh, V. N., absorption and reflection coefficient of ionosphere, 3014
Kessler, R. E., with others, mobile television equipment, 460
Keto, J. E., with others, airborne radar equipment, (A) 1528
Kharbanda, S. R., with others, television sound on vision carrier, 3091
Khlebnikoff, N. S., complex photocathodes, (A) 1819, 3780
—— and A. E. Melamid, photocells with Sb-Cs cathodes, (A) 2081, 3783
Khouri, A. S., with C. Brunetti, printed electronic circuits, 1887
Khvostikov, I. A., with others, polarization and ionization at half-light, 1641
Kiang, S. C., with others, relative nature of electromagnetic radiation, 3252
Kikoin, L., with S. Gubar, temperature/resistance relation for Hg, 1877
Kilgore, H. M., science and the government, 1406
Kimball, G. E., thermodynamics of relaxation processes, (A) 3587
Kimball, E. R., with W. C. Miller, sound recording equipment, 22
Kinert, J. O., naval warfare communication, (A) 1666, 2998
King, A. H., ionization gauge regulator, 2069
—— with others, cavity magnetrons, 3782
King, A. P., with S. D. Robertson, u.s.w. propagation in rain, (A) 1636, 1972
King, D. D., aerial impedance measurement, (A) 3684
King, G. M., a-f amplifier, 837; v.f. oscillator, 2848
King, G. W., with others, microwave absorption of water vapour, (A) 3235
King, J., receivers, hum reduction, 3631, output stages, 722, servicing, 1964
—— R. B. Temple and H. W. Thompson, c.r. recording of infra-red spectra, 3374
King, P., with others, paint thickness meter, 2286
King, P. G. R., skiatron in radar display, 2404
King, R., Hallén's integral equation for aerials, (D) 2141
—— and D. Middleton, cylindrical aerials, current and impedance, 1453, (C) 3547
—— with D. Middleton, cylindrical aerials, comparison of theories, 1771
King, R. W. P., Electromagnetic Engineering (B), 1129
—— H. R. Mimno and A. H. Wing, Transmission Lines, Antennas and Wave Guides (B), 555
King, W. W., 114-Mc/s crystal control, 3807
Kingslake, R., photographic lens types, 3090
Kinser, G. D., and J. W. McGee, precipitation-static interference reduction, 2322
—— with others, precipitation-static problems, 1991
Kircher, R. J., coil-neutralized v.h.f. amplifier, 893
Kirk, J., with S. Pakswer, colour temperature measurement, 2275
Kirke, H. L., frequency modulation, B.B.C. field trials, 3751
Kirkman, R. A., and M. Kline, transverse electric modes in coaxial cavities, 888
Kirschbaum, H. S., with others, electrical analogy for servo-mechanisms, 1362
Kitaigorodsky, I. I., electron microscope and ceramic structure, 1951
Kitchenn, R. G., low distortion diode detector, (D) 1989
Kiver, M. S., U.H.F. Radio Simplified (B), 1143
Klanfer, L., with H. Motz, computation of electron optical systems, 1315
Klapperich, A. J., with W. J. Polydoroff, iron dust core permeability, 646
Klarfeld, B., gas discharge calculation, 1512
Kleinberger, R. C., coupling method for dielectric heating, 2496
Kline, M., with R. A. Kirkman, transverse electric modes in coaxial cavities, 888
Klipsch, P. W., two-horn woofer-tweeter loudspeaker, 529, 830, 1487
Kluender, E. C., with T. Grover, merchant-ship radar, 3398
Knauert, W., with others, midget earphones, (A) 3534
Knight, A. R., and H. Storck, selective pulse system, 2309
Knipp, J. K., theory of diode, (A) 3820
Knowles, D. D., survey of electronic applications, 153
Knowles, H. L., atmospherics d.f., (A) 3293
Knowles, H. S., war-time acoustic developments, (A) 1159
Knowles, R., low distortion diode detector, 1988, (D) 1989
Knudsen, V. O., sound propagation in atmosphere, 3510
Koch, A. R., and G. H. Floyd, transceivers and aerials for 13 cm, 2758
Kock, W. E., metal lens aerials, (A) 1448, 2490
Koenig, W., H. K. Dunn and L. Y. Lacy, sound spectrograph, 3517
Kolin, A., current measurement with mercury manometer, 975
Kolin, H., with others, tropical moisture and fungi, 1876
Koller, R., vacuum switch, (A) 2081
Kompaneyets, A., absorption of light by plasma, 3542
Kopp, G. A., and H. C. Green, phonetic principles of visible speech, 3518
Koppa, F. R., with W. F. Horner, tropical treatment of military equipment, 519
Korbelak, A., electrochemical processes, (A) 647
Korff, S. A., Electron and Nuclear Counters (B), 3061; triode particle counters, (A) 1361
—— and B. Hamermesh, cosmic-ray radiosonde techniques, 3966
Kormakova, E., photoelectric electron multiplier, (A) 2028
Kornei, O., playback loss in gramophone records, 1
Kozirev, V., with others, paramagnetic absorption, 3543
Kraitchik, M., Alignment Charts: Construction and Use (B), 663
Kramer, A. W., Elementary Engineering Electronics (B), 1236
Kramer, B., and F. Stolte, propagation velocity measurement in cables, 2977
Kranert, W., and H. Raether, cold working of metals, 955
Krasnushkin, P., supersonic absorption measurement in gases, 2459
Krassilnikov, V., sound propagation in turbulent atmosphere, 1692
Krassin, A. K., electric breakdown of solid dielectrics, 946
Krauer, O., with others, exciter-regulator for aircraft alternators, 3064
Kraus, J. D., with others, v.h.f. aerials and d.f. systems, (A) 1448
Krauss, H. L., aerial radiation pattern calculation, 23
Kravetz, T., Fresnel reflection formulae, (A) 1807
Kreielsheimer, K., and R. Belin, radiosonde recording of potential gradients, 1955
Kreisher, C., polyethylene spacers for coaxial cables, 28
Kretzmer, E. R., pulse modulation, (D) 3054
Krishnan, K. S., and A. B. Bhatia, resistance of liquid alkali metals, 342
Kron, G., tensors and equivalent circuits, 1868
Kronenberg, M. H., television i.f. amplifiers, 2594
Krueger, R. M., flexible coaxial cables, 1766
Krüger, K., with P. von Handel, Funknavigation in der Luftfahrt (B), 628
Krushel, I., phosphors in television, 1272, 1273
Kubetsky, L., secondary emission photocell, (A) 2089
Kuhn, H., with H. G. East, bellows manometer, 3427
Kuhner, M., and A. M. Gratzmuller, reflection klystrons, 3776
Kulansky, J. K., selective calling system, 2731
Kundt, W., with R. Suhrmann, secondary emission from thin metal films, [illegible]

L

Labhardt, H., transmitting stations for police and fire, 3453
Lacase, J., measurement of small capacitances, 2636
Lack, D., and G. C. Varley, radar echoes from birds, 332
Lacy, L. Y., with others, sound spectrograph, 3517
Lacy, R. E., microwave relay for army communication, (A) 1666
Laden, L., European radio industry, 3153; plastics in radio, 950
Ladner, A. W., inverted speech, 13
Lafferty, R. E., correction for voltmeter loading, 2632; phase-shifter nomograph, 2151
Laing, K. M., plating quartz crystals, 2227
Lamb, J., coaxial line stub, 2123, (A) 3173
—— with others, cm-wave dielectric measurements, 966, (A) 1915
Lambert, K. B., mixer potentiometer, 7
Lamont, H. R. L., with others, u.h.f. radio measurements, 1914, (A) 2963
Lance, T. M. C., large-screen television, 463
Lancoud, C., fault detection in cables, 428
Landau, H. L., mobile 2-18 Mc/s long-range radioteletype, 3667
Landau, L., energy loss of particles by ionization, 2177
—— with Ya. Zel'dovich, liquid and gaseous metals, 3639
Landman, A., asymmetrical butterfly circuit, 1306
Landsberg, K. V., with others, mobile television equipment, 460
Lane, C. E., duplex quartz crystals, 1583, (A) 1918
Lamar, E. S., and C. R. Sawyer, sonar, 1750
Lansing, J. B., duplex loudspeaker, 18; public address loudspeaker, 2194
—— and J. K. Hilliard, two-way theatre loudspeaker, 530
Lasel, L. H., with others, removal of electron beam from betatron, 3439
Lapp, R. E., cosmic rays, origin, 2181
Lark-Horovitz, K., and V. A. Johnson, resistivity in germanium alloys, 2216
—— and others, electrical properties of germanium alloys, 2218
—— with V. A. Johnson, thermoelectric power in germanium, 2216

—— with R. M. Whaley, effect of atmosphere on Ge rectifiers, (A) 3635
Larsen, F. J., supersonic radar trainer, 2582
Larsen, M. J., and L. L. Merrill, capacitance-coupled i.f. amplifiers, (A) 1462
Last, E., blocking oscillator as timer, 68 ; restorer-circuit operation, 67
Latham, R., A. H. King and L. Rushforth, cavity magnetrons, 2782
Lattin, W. J., Fourier series for pulse forms, 116
Laurent, A., testing in valve manufacture, 3482
—— with others, transmitter valves, 490, 1110
Laurent, C. M., hypso-wattmeter, 3631
Laurent, T., with G. Hägg, machine for summation of Fourier series, 2957
Laver, F. J. M., with C. F. Booth, frequency standard and applications, 2973
Law, H. B., with others, image orthicon, (A) 1704, 3085
Lawrence, A. S.C., future of scientific films, 3829
Lawson, A. W., B. Goodman and L. I. Schiff, h.f. rectification efficiency of crystal detectors, (A) 3636
Lawson, D. L., television multipath interference, (A) 788, videosonic system, 459, 2063
—— A. V. Lord and S. R. Kharbanda, television sound on vision carrier, 3091
Lawson, J. L., with A. M. Stone, double-tuned circuits, 2152
Lazareff, B., and L. Kahn, obtaining high pressure at low temperatures, 2595
Lea, N., stability of LC oscillators, 569, 2523, (D) 2850
Lebedinsky, A. L., with L. E. Gurevich, magnetic field of sunspots, [illegible]
Le Blan, L., comparison of unmodulated light fluxes, 1088
Leblanc, M., with G. Ribaud, form factor of induction ovens, 2270
Lebourg, M., with others, mine detector, 1825
Lechner, M., aids to production, 1137
Leck, G. W., with others, pulse altimeter, (A) 1528
Lecuir, R., with F. Violet, ceramics technique, 3327
Ledbetter, J. B., broadcast studio acoustics, 2119
LeDuc, H. A., h.f. crystal diodes, 2077
Lee, A., and D. K. C. MacDonald, extension of Thévenin's theorem, 37
Lee, C. C., Waves and Wave Action, bibliography (B), 718
Lee, G. M., microwave oscillograph, (A) 1576, 1692
Lee, H. B., stereophon sound recording system, 2128
Lee, J. M., f.m. handie-talkie, 1716 ; f.m. radio relay, 748 ; thermoelectric generator for portable equipment, 2734 ; voice-controlled tape recorder, 537
Lefor, N., 100 W28 Mc/s transmitter, 2377
Legg, V. E., optimum air-gap in iron-cored chokes, 763, (D) 2340
Lehany, F. J., and K. G. Dean, crystal filter theory, (A) 1206
Lehmann, G., dimensional analysis for u.h.f. triodes, 3821
Leitner, R. G., magnetic-gramophone pickup, 1153
LeMieux, A. F., and W. W. Beeman, X-ray tube current and voltage stabilization, 2330
Lempert, I. E., and R. Feldt, high-voltage c.r. tube, 3123
—— with P. S. Christaldi, c.r. tube selection and power supply, 775
Leonhard, A., stability of feedback amplifiers, 567
Leontovich, M. A., e.m. wave propagation, theory, 3009
—— and M. L. Levin, excitation of vibrators in aerials, 2825
LePage, W. R., ladder network termination, 3539
Leslie, E., mine detectors, 3390
Lester, J. M., pulse-delay network, design, 1785
Leutritz, J., Jr, and D. B. Herrmann, tropical insulation of plastics, 1562
Leverenz, H. W., phosphor excitation, (A) 3621
Levin, M. L., with M. A. Leontovich, excitation of vibrators in aerials, 2825
Levinson, N., and T. T. Goldsmith, Vitasound sound film reproduction, 3
Levinstein, H., with others, electron microscope shadow-casting unit, 1007
Levinthal, E. C., cascade amplifier klystrons, (A) 1730
Levy, H., and E. E. Preidel, Elementary Statistics (B), 3340
Levy, M., power pulse generator, 2761 ; valve voltmeter with stable zero adjustment, 976
Levy, M. M., Fourier series, 3651
Lewer, S. K., Cathode-Ray Tube Handbook (B), 2355 ; crystal-controlled f.m., 479, 2769
Lewis, R., flux valve aero compass, 603
Lewis, T., point electron theory, 1509
Lewis, W., Thin Films and Surfaces (B), 2950
Licklider, J. C. R., speech intelligibility and amplitude distortion, (A) 3524
Liebmann, G., amplifier valve characteristics, 2406, (A) 3484 ; image formation in c.r. tubes, (D) 3483 ; ion burn in c.r. tubes, 2403, 3824
Liebscher, A., audio chanalyst, 983
Linder, E. G., with R. L. Sproull, resonant-cavity measurements, 2240
Lindhard, J., free electrons in static field, 3242
Lineback, H., writing c.r. tube, 1705
Link, J. C., with E. L. Luke, enemy radio and radar equipment, (A) 1528
Liston, M. D., and others, contact-modulated d.c. amplifier, 2629
Litt, S., resistance measurements, 1292
Littlefield, T. A., with W. E. Curtis, stereo-episcope, 504
Littlejohn, H. C., heat dissipation from instrument casings, 1415
Ljungberg, J., rural line repeater, 3045
Lober, C. F., wide-range test oscillator, 2158
Loeb, L. B., mechanism of static electrification, 908
Logan, E. A., fireballs, 1238
Loh, H. Y., with others, spectral intensity measurements, 2274
Long, A. G., X-ray tube manufacture, 215
Long, T. H., eddy-current resistance of multilayer coils, 764 ; wire recorder head, (A) 1754, 2127
—— and G. D. McMullen, B-H curve tracer, (A) 2014, 2247
Lonsdale, K., research at Davy Faraday Lab., 1873
Looser, R. C., with others, power loss in e.m. screens, 1077
Lord, A. V., with others, television sound on vision carrier, 3091
Lord, M. P., and A. L. G. Rees, phosphors, decay characteristics, 2594, ZnS with periodic excitation, 2593
Love, D. P. See Loye, D.P.
Lovell, C. A., with others, tone synthesis, (A) 3513
Lovell, W. V., a.c. electromagnet for non-magnetic substances, (A) 2430
Lowry, H. V., matrix theory of networks, 55
Loye (Love), D. P., and R. L. Morgan, absorption measurement of acoustic materials, 2117
Lü, L. Y., with others, cosmic radiation, asymmetry and absorption, 3274
Lubcke, H. R., television technique of Don Lee Broadcasting System, 484, 485
Lubkin, S., bimodal oscillator, 1485
Lucantonio, F., a.f. relay dialling systems, 3793
Luchsinger, W., curve fitting, 3328
Luck, D. G. C., omnidirectional radio-range system, 2200 ; shielded-U Adcock d.f., (A) 1861
Ludman, W. W., time-base calibration, 128
Luke, E. L., and J. C. Link, enemy radio and radar equipment, (A) 1528
Lukianov, S., secondary emission of solid bodies, (A) 2074
Lukirski, P. I., electron emission from metals, 3581 ; field-emission of electrons, (A) 1952
Lukoshkov, V., electrostatic properties of valve grids, (A) 2397
Lundburg, F. J., with others, aircraft u.h.f. course indicator, 932
Lundstrom, O. C., with T. Moreno, microwave power measurement, (A) 1576
Lung, W. S., with T. L. Ho, variation of light path with frequency, 3231
Lunt, A. P., insulated wire and cables, 2604
Lyman, H. T., u.h.f. television receivers, (A) 1649
Lynn, J. T., with others, r.f. resistance of iron wire and permalloy strip, 1266
Lynn, L. H., and O. H. Winn, marine radar for peacetime use, (A) 1847, 2578

M

Ma, S. T., Fourier transforms, 588
McAvoy, D. F., r.f. voltmeter probe, 1591
McCaig, M., with A. Duperier, cosmic rays and sunspot activity, 2887
McCallum, C. C., triode-connected tetrodes and pentodes, 2036
McCann, G. D., S. W. Herwald and H. S. Kirschbaum, electrical analogy for servomechanisms, 1362
—— with F. E. Andrews, lightning protection of h.t. lines, 760, (D) 2334
MacColl, L. A., Fundamental Theory of Servomechanisms (B), 1375
McCombs, R. K., and F. C. Walz, pulse generator, (A) 1486
McConnell, J., negative protons, (A) 3571
McCool, W. A., automatic control for locked multivibrators, 474
McCormick, E. M., small oscilloscope, 1079
McCready, L. L., with others, solar noise, 1823
Macdiarmid, I. F., and H. J. Orchard, transmission line formulae, 2476
MacDonald, D. K. C., with R. Fürth, shot effect, in diodes, 3126, statistical analysis, 3411
—— with A. Lee, extension of Thévenin's theorem, 37
McEachron, K. B., Jr, with others, curricula of U.S. engineering colleges, 1124
McGee, J. W., with G. D. Kinzer, precipitation-static interference reduction, 2322
Macgeorge, W. D., electronic switches, 2025
McGrath, S., with others, blind bombing radar, 2196, 2579
Macherey, C., saturation currents in thermionic emission, 796
MacIlvain, K. M., air traffic control recording, 3126
McIntosh, L. R., with others, h.v. electrostatic generator, (A) 3777
McKay, H. A. C., radar echoes from birds, 333
McKenzie, A. A., loran, 926, 1531
Mackenzie, J. K., isolating pads, 298
Mackeown, S. S., and J. W. Miles, waveguide theory, 30
McKinley, D. W. R., detection of submerged submarines, 1241
McKinley, R. B., with L. D. Madsen, low-voltage cables, 341
McLachlan, N. W., computation of Mathieu equation solution, 1277 ; heat conduction and inductance in elliptical cylinder, 3570
MacLaren, F. B., A.A. gunfire control, (A) 1528
McLarn, E. S., H. Oster, H. Kolin and A. Neumann, tropical moisture and fungi, 1876
McLean, F. C., and F. D. Bolt, transmission lines for broadcasting, 281, 2139, (A) 3180
McLean, M. N., preferred numbers and filter design, 299
McMillan, E. M., particle acceleration in synchrotron, 439, 440, (D) 2036, (D) 2038
McMillan, F. L., with others, electron capture and t.r. switch recovery, (A) 3818
McMullan, D., single-sweep timebase, 571, 885, (A) 2162
McMullen, G. D., with T. H. Long, B-H curve tracer, (A) 2014, 2247
McNall, J. W., H. C. Steele, Jr, and C. L. Shackelford, secondary-emission cathodes for magnetrons, (A) 1730
McNicol, A. S., radio receiver specifications, 173
McPetrie, J. S., L. H. Ford and J. A. Saxton, half-wave aerial with V reflector, (A) 291, (A) 3190
—— and J. A. Saxton, electrical properties of soil at λ 2 and 5m, (A) 711, (A) 1022 ; linear aerials, 1450
MacPherson, H. G., with L. L. Winter, operation of graphite anodes, 1106
McQuay, J., cavity wavemeter, 1596 ; clamping circuits, 2530 ; limiting circuits, 1802 ; pulse-forming circuits, 2161 ; radar, display systems, 330, elements, 930, 1538 ; video amplification, 3096
Maddock, A. J., dielectric heating, 3377, charts, (C) 899 ; thyratrons in radio engineering, 2090
Madella, G. B., two-phase RC oscillator, 3218
Madsen, C., with G. A. Caldwell, electronic engineering applications, 2273
Madsen, C. J., with R. M. Baker, h.f. heating of conductors and non-conductors, 146
Madsen, L. D., and R. B. McKinley, low-voltage cables, 341
Maggs, F. A. P., valve relay circuits, 2722
Magnan, C., P. Chanson and A. Ertaud, proton microscope, 2659
Mahaffy, F. J., meteorology and electrical engineering, 505
Mahanti, P. C., M. K. Mukherjee and P. B. Roy, properties of Indian mica, 1268
Maibauer, A. E., with C. S. Myers, polyethylene, (A) 2130
Maibaum, B. K., Drude's second method, 2623
Maier, K., errors in rectifier moving coil instruments, 3350
Maier, P. E., humidity recording, 3372
Maiers, M. J., dielectric heating survey, 149
Maiman, T., with G. E. Hamilton, voltage-regulated power supplies, 756, 1076, 1688
Makov, S. A., directive acoustic and radio radiators, 857
Malcolm, J. L., piezoelectric physiological recording, 2985
Malling, L. R., electronic wattmeter, 680
Malm, F. S., synthetic rubber vulcanization, 2221
Malmfors, K. G., magnetic field and cosmic radiation, 322
Malmquist, K. G., H. Norinder and W. Stoffregen, photographic timing, 3353
Maloff, N., field radiated from open waveguide, 2468 ; h.f. conductivity of salt solution, 2549
Mample, A. Z., soldering with tin-lead alloys, 2944
Manchester, H., loran, 3609
Mandel, P., 1015-line television system, 2741
Mandelstam, L. I., and N. D. Papalexi, propagation experiments by interference method, 1638
Manildi, J. F., multiple magnetic circuits, 752
Manley, R. G., Waveform Analysis (B), 986
Manley, R. J., vibration analysis, 3142
Mann, E. R., with others, magnetic testing of ferromagnetic metals, [illegible]
Manuele, J., and C. Goffman, quality control, 503, (D) 2425
—— with C. Goffman, preparation of specifications, 3146
Marbaker, E. E., silicone coating for resistors, (A) 2215
Marchand, N., f.m., frequency control methods, 3105, fundamentals, 1675, interference, 1994, modulators, 2068, 2383, phase modulation conversion, 2767, transmitter, 3452, using ph.m., 2766
Marchant, P. A., and K. M. Heron, Post Office radar equipment, 1540
Marchbanks, M. J., coreless induction furnaces, (A) 1937
Marchetti, J. W., with H. A. Zahl, early warning radar, 1249, 1535
Marcum, J., accelerated electrons in a.c. field, 1394
Marcus, K. E., valve colour code, 246, 484
Marcy, H. T., parallel circuits in servomechanisms, 3763
Margenau, H., h.f. conduction and dispersion of ionized gases, 3246
Margerison, T. A., and W. Sucksmith, magnetic potentiometer for B-H curves, 3349
Marion Electric Instrument Co., fluxmeter, 1287
Marique, J., 500 kc/s ship aerial radiation patterns, 2071
Markus, J., economics of electronics, 1619 ; electronic heating of wood, 3694
—— and V. Zeluff, Electronics for Engineers (B), 1421
—— with N. M. Cooke, Electronics Dictionary (B), 1741
—— with V. Zeluff, electricity and electronics developments, 513
Maron, W., crystal-tuned f.m. receivers, 169 ; v.h.f. power measurement, 118
Marshall, C. E., photoelectric street lighting control, 3379
Marshall, C. J., and L. Katz, television equipment for guided missiles, 2738
Marshall, F., phosphorescence decay of X-ray screens, (A) 3302
Marshall, F. B., with others, probe error in waveguide standing-wave detectors, 981
Marshall, J., all-purpose receiver, 407
Martin, D. W., magnetic throat microphones, (A) 3533
Marton, C., and S. Sass, bibliography of electron microscopy, 1008
—— with others, stability of specimens in electron microscopy, 3386
Marton, L., N. N. Das Gupta and C. Marton, stability of specimens in electron microscopy, 3386
Marvin, H. B., with others, development in design engineering, 2096, [illegible], 1558
Marx, E., polarized light and photoelectric falling-off effect, 3232
Marzin, A., carrier-current transmission, history, (A) 732
Mason, W. P., KDP and ADP crystals, (A) 1260, 2208, 2925
Massa, E. A., F. Paganelli and F. A. Best, Jr, radar for aircraft fire-control, (A) 1528
Massa, F., microphones for sound-pressure measurement, 2459
Massachusetts Institute of Technology, Radiation Laboratory Technical Series (B), 1549
Massoneau, R. F., counter circuit, (A) 1779
der Mateosian, E., and H. Friedman, organic vapours for self-quenched G-M counters, (A) 3762
Mathematical Tables Project, Table of Arc Sin X (B), 1575 ; Tables of Associated Legendre Functions (B), 1279
Mathes, K. N., with B. H. Thompson, insulation corrosion in tropics, [illegible]
Matras, J., broadcasting as cultural medium, 3504
Matricon, M., continuously evacuated transmitting valves, 3482 ; frequency modulation, 3419
—— and J. Chantereau, transmitter valve manufacturing technique, 3482
—— and others, transmitter valves, 490, 1110
Matschinsky, M. W., arrangement of several loudspeakers, 269
Matthews, A. C., fidelity of sound reproduction, 528
Matthias, B., with P. Scherrer, piezoelectric crystals in wave filters, 3106
—— with others, wide-band crystal filters, 579
Maurer, R. J., electrical properties of semiconductors, 345
Mautner, L., input impedance chart for lossless transmission lines, 2477
Maxwell, E., with others, superconductivity of lead at λ 3 cm, 3258
May, A., with G. H. Shortley, coil for constant magnetic gradients, [illegible]
May, R. W., and N. H. Hale, automatic position control mechanisms, 1374
Meador, J. R., water-cooled transformers, 2016
Medina, L., zero-suppressed voltmeter, 675
Meek, J. M., impulse voltage measurement, 385, (AD) 967, 2694, (A) 2964
—— and F. W. Waterton, h.v. vacuum electrometer, 374
Meeker, W. F., with others, vibrations of free-edge disk in baffle or horn, (A) 3512
Megan. See Megaw
Megaw, E. C. S., u.s.w. propagation, 3017
—— with W. E. Willshaw, magnetron, 3118
Mehta, G. K., with N. R. Tawde, probe method for h.f. discharge study, 1872
Melamid, A. E., with N. S. Khlebnikoff, photocells with Sb-Cs cathodes, (A) 2031, 3783
Mellen, G. L., radium-type vacuum gauge, 1867, (A) 3617
—— with J. R. Downing, linear response vacuum gauge, 3616
Mentzer, J. R., multi-voltage regulated power supplies, 3796
Mercer, W. R., with others, f.m. altimeter, (A) 1528
Merchant, M. E., friction and boundary film, (A) 2173
Merchant, R., and A. E. Harrison, portable 5300-Mc/s transmitter-receiver, 1100
Merrill, A. A., use of logarithmic graph paper, 3654
Merrill, G. S., r.m.s. slide rule, 2955
Merrill, L. L., with M. J. Larsen, capacitance-coupled i.f. amplifiers, (A) 1462
—— with others, vibrations of free-edge disk in baffle or horn, (A) 3512
Mertz, P., communications in Germany, 3151
Meschter, E., intermodulation test for sound films, 271
Messenger, T. H., dielectric heating in rubber industry, 3695
—— and D. V. Onslow, Capacity Current Heating (B), 1959
Messinger, H. P., and T. J. Higgins, inductance of coaxial busbars, 2315
Metropolitan-Vickers Electrical Co., marine radar, 3611
Meyerhof, W. E., contact p.d. in crystal rectifiers, (A) 3465
—— and P. H. Miller, Jr, contact potential measurement, 1282
—— with others, contact p.d. in barrier-layer rectifier, 1519, [illegible]
Meyers, S. T., multipath propagation in f.m. systems, 2321
Meyerson, A. H., v.h.f. coil design, 66, 2732
Michel, B. M. H., with J. D. Goodell, auditory perception, 2797
Middelton, A. D., simple amateur transmitter, 2754
Middleton, A. E., with others, electrical properties of germanium alloys, 2216
Middleton, D., and R. King, cylindrical aerials, comparison of theories, 1771
—— with R. King, cylindrical aerials, current and impedance, 1453, (C) 3547
Middleton, R. G., amplifier analysis, cascode, 2509, feedback, 1788
Miedke, R. C., decibel conversion chart, 1281
Migdal, A., cosmic rays, 74
Migulin, V. V., with J. L. Al'pert, effect of earth on e.m. propagation, 1639
Mikhailine, I. M., with others, polarization and ionization at half-light, 1641
Mildner, R. C., power-rating of r.f. cables, 3066
Miles, J. W., plane discontinuities in cylindrical tubes, 815, 816
—— with S. S. Mackeown, waveguide theory, 30
Miles, P. D., F.C.C. frequency allocations, (A) 1666, 2001
Millar, J. Z., Western Union beam telegraphy systems, 3048, 3748
Miller, A. H., 6BP audiometer, 839
Miller, B. F., elimination of distortion in volume compressors, 274
Miller, B. J., with R. D. Huntoon, proximity fuse, 624
Miller, C. J., Jr, standardization of quartz crystal units, (A) 1700
Miller, E. P., with others, electrical properties of germanium alloys, 2216
Miller, G. A., and S. Mitchell, speech distortion at high altitudes, (A) 3522
Miller, G. K., with others, mine detector, 1825
Miller, H. A., Grassot fluxmeter, 2969 ; magnetic field under ships, 3602
Miller, H. J., glass for miniature valves, (A) 1565, (A) 1730
Miller, J., with others, masking of speech, (A) 3527
Miller, J. C. P., with others, Index of Mathematical Tables (B), 3339, 3660
Miller, J. M., testing r.f. cables, (A) 2130
Miller, P. H., noise spectrum of crystal mixers, (A) 1649
Miller, P. H., Jr, and B. Goodman, optical microwave detector, (A) 3409
—— with W. E. Meyerhof, contact potential measurement, 1282
—— with others, electrical contact noise, 3263
Miller, W. C., and H. R. Kimball, sound rerecording equipment, 22
Millington, G., curved earth geometrical optics, 1687
Mills, J., electrical communications, descriptive survey, 181 ; electronics, 72
Milnor, J. W., tapered transmission lines, 32
Mimno, H. R., with others, Transmission Lines, Antennas and Wave Guides (B), 555
Mindlin, R. D., dynamics of package cushioning, 2106
Miner, W., post-war television, 454
Minter, J., a.f. distortion, 1644 ; television receiver alignment, (A) 1089
Mironov, A. V., with others, polarization and ionization at half-light, 1641
Mital, K., magnetism of sun, 2888
Mitchell, R. M., X rays and radio industry, 1623
Mitchell, S., with G. A. Miller, speech distortion at high altitudes, (A) 3522
Mitra, S. K., auroral spectrum, 2904
—— and J. N. Bhar, radar, 928
Mittelman (Mittelmann), E., automatic rematching in h.f. heating, (A) 1934
—— and G. F. Bosomworth, electronic rubber preheater, 2629
Mix, D., amateur-band amplifier, 481, 2771 ; amateur transmitters, 28 Mc/s low power, 1721, 60-W c.w., 2060, 800-W, 2749; v.f.o. using valves, 3808
Moerman, N. A., four-channel electronic switch, 1780
Mofenson, J., radar echo from moon, 1856
Moholy, L., microfilm, 2409
Moles, F. J., cloud range meter, 1943
Molloy, E., and others, "Electrical Engineer" Reference Book (B), 1140

Monfort, R. A., television, principles, **2736**, receivers, **3447**
Mongan, C. E., Jr, supersonic echo observations, **(A) 3514**
Montagne, R., components in manufacture of transmitter valves, **3482**
—— with others, transmitter valves, **490, 1110**
Montani, A., infrasonic switching, **1667** ; lens aberration in television projection, **1379** ; radio hearing aid, **1783**
Montgomery, B. E., u.h.f. aircraft aerial, **85**
Montgomery, C. G., and others, electron capture and t.r. switch recovery, **(A) 3818**
Montgomery, D. J., generalized electrodynamics and electron interaction, **(A) 1218**
Montroll, E. W., Bessel functions of imaginary argument, **1900**
Montsinger, V. M., thermal characteristics of transformers, **2015, 3062**
Moody, R. C., with F. L. Hopper, outdoor sound propagation, **1423**
Mooney, R. L., theory of reflection-reducing coatings, **313**
Moore, A. R., with A. M. Glover, photocell for sound on colour film, **3076**
Moore, D. W., Jr, fuel consumption indicator, **1611** ; plane-to-ground radio telemetering, **701** ; test oscillator, 40–500 Mc/s, **2651**
—— and F. G. Willey, radio telemetering, **(A) 1613**
Moore, J. B., temperature-compensated heterodyne oscillator, **241**
Morcom, W. J., transmitting, receiving and hailing set, **1386**
Morel, P., with H. Grumel, mine detection, **3712**
Moreno, T., waveguide systems, **2136, 2470**
—— and O. C. Lundstrom, microwave power measurement, **(A) 1576**
Morgan, M., noise and receiver sensitivity, **176**
Morgan, R. L., with D. P. Loye (Love), absorption measurement of acoustic materials, **2117**
Moriarty, C. D., industrial X-ray developments, **1305**
Moritz, C., transient video analyser, **2647**
Morozoff, P. M., and M. M. Butsloff, caesium oxide photocathodes, **(A) 2033, 3781**
Morozov, V. M., with others, polarization and ionization at half-light, **1641**
Morrell, W. E., slide rule for addition of squares, **2616**
Morrical, K. C., room surfaces in studios, **(A) 2319**
Morris, A. R., welding platinum electrodes, **2612**
Morris, C. M., with others, valves for f.m. conversion, **(A) 1730**
Morrow, M. G., radio forecasting, **1964**
Morrow, N. M., secondary radiation from X-ray filters, **3595**
Morton, G. A., and L. E. Flory, infra-red image tube, **3471**
—— with others, Electron Optics and Electron Microscope (B), **1969, 2358**
Moses, G. L., with T. A. Kauppi, silicone insulating materials, **99**
—— with others, silicone insulating materials, **96**
Moses, R. C., expander-compressor a.f. amplifier, **2518**
[illegible] S., pulse amplifier coupling, **893**
Moss, H., c.r. tube electron gun, **3124**, image formation, **(D) 3463** ; timebase converter, **306, (A) 886, (A) 887, (D) 2093** ; waveform analysis, **1917, 2244, 2966**
Motz, H., and L. Klanfer, computation of electron optical systems, **1315**
Motz, H., and W. D. Worthy, calculation of magnetic field by relaxation, **658, (A) 1573**
Moulton, F. R., and J. J. Schifferes, Autobiography of Science (B), **2109**
Mouromtseff, I. E., valves, history and development, **245**
Moyer, J. C., and E. Stotz, electronic blanching of vegetables, **393**
Muehlhause, C. O., and H. Friedman, high-speed counters, **(A) 1460**
Mueller, C. W., secondary emission of pyrex glass, **(C) 1392**
Mueller, G. E., u.s.w. propagation and rain, **(A) 1636, 1973**
Muir, A. J., and J. W. Whitehead, c.r. tube for modulation at u.h.f., **3769**
Mukerjee, G. C., with S. S. Banerjee, s.w. fading, **2290**
Mukherjee, M. K., with others, properties of Indian mica, **1968**
Mulders, E. S., with S. B. Nicholson, solar and magnetic data, Oct./Dec. 1945, **1821**, Jan./March 1946, **2554**
Mullaney, J. H., half-rhombic aerial, **855**
Müller, E. W., resolving power of cold-cathode electron microscope, **1010** ; velocity distribution of field-emission electrons, **1104**
Muller, F. A., and K. Zimmerman, v.h.f. transmission line test equipment, **982**
Muller, J. F., with others, tone synthesis, **(A) 3513**
Muller, W., inductance bridge, **2636** ; standard-signal generator, **1297** ; transitron oscillator, **1289**
Müller-Strobel, J., electroacoustic transducer, **965**
Mullins, L., industrial radiology, **105**
Mumford, A. H., G.P.O. radio communication developments, **730, 1102, 2773**
Mumford, W. W., directional couplers, **(A) 1446**
—— with others, gas-discharge t.r. switch, **2783**
Münch, G., solar spectrum, **2556**
Mundel, A. B., with others, midget earphones, **(A) 3534**
Murphy, A. E., f.m. systems, **(A) 1671, (A) 1673**
Myers, C. S., and A. E. Maibauer, polyethylene, **(A) 2120**
Myers, P. B., crystal control at 450 Mc/s, **1986**

N

Nachod, C. P., LC circuit frequency nomogram, **1904**
Nagaotte, E., modified Helmholtz coils, **2720**
Nagy, P., and M. J. Goddard, time-base converter and frequency-divider, **3896**
Nahmias, M. E., Le Cyclotron (B), **2357**
Nahstoll, G. A., and F. R. Bryan, multiplier photocell for spectrochemical analysis, **395**
Narayan, A. L., sunspots, **2183**
National Bureau of Standards, mathematical tables, survey, **3653**; Ni plating on steel, **3324** ; purification of Rh plating baths, **3323** ; testing of radiosondes, **396**
Nature, ASLIB annual conference, **496** ; cosmic-ray conference, **321** ; Decca navigator, **331** ; organization of scientific literature, **3123** ; patent law, **3460** ; radio meteorology, conference, **3013** ; scientific and industrial research, **3128**, Bush report, **493**, D.S.I.R. programme, **3129**
Naumann, O., L and C measurement for conductors and cables, **3346**
Neddermeyer, S. H., measurement of ultra-short time differences, **(A) 3662**
Needham, W., with others, non-ohmic resistors, **(A) 1885, (A) 2606**
Neel, L., coercive field theory, **3249**
Neher, H. V., reflex klystrons, theory, **(A) 2393**
Neher, J. H., r.f. cables in U.S.A., **(A) 2130**
Nelson, H., vacuum leak detector, **396**
Nelson, R. B., tuning multiple-cavity magnetrons, **(A) 3460**
Nereson, N., with B. Rossi, counter discharge time intervals **2096**
Neumann, A., with others, tropical moisture and fungi, **1876**
Nevzgljadov, V. G., turbulence, **1563**
Newell, H. E., Jr, transmission-line tuning elements, **63**
Newman, M., and A. O. Kemppainen, h.v. installation for lightning investigations, **2344**
Newstead, G., aviation radio, **3425**
Nichols, C. E., 28-Mc/s directional aerial, **2887**
Nicholson, P. I., exhibition of German electronic equipment, **1940**
Nicholson, S. B., and E. S. Mulders, solar and magnetic data Oct./Dec. 1945, **1821**, Jan./March 1946, **2554**
Nicolas, P., e.m. oscillations in solids and cavities, **3211**
Nield, E. W., quartz frequency standard, **3363** ; 8-valve communications superhet., **3734**
Nielsen, D. B., electrical measuring instruments, **1285**
Nielsen, H. H., with F. P. Dickey, infra-red spectrum of heavy water, **(A) 3239**
Niessen, K. F., field of vertical dipole above earth, **[illegible]** ; frequency stability of cavity resonators, **3208, 3209, 3210**
Nijenhuis, W., transients in ladder networks, **2836**
Nikitin, S., with others, cosmic rays, **1516**
Nisewanger, C. R., and F. W. Brown, explosion velocity chronoscope, **2261**
Nitta, A., u.h.f. directive aerial, **1776**
Nixon, G. M., high fidelity sound transmission and reproduction, **[illegible]**
Noack, W. G., with K. Sachs, h.f. and communications engineering, **3745, 3746**
Noble, P. C., with A.M. Gurewitsch, stabilized d.c. high-voltage supply, **1366**
Nobles, C. E., strato-television, **3090**
Noll, E. M., television circuits, deflection, **2743**, power supply, **2349**, sweep oscillators, **1381**, synchronizing and separation, **1710**, video, **782**
Norinder, H., with others, photographic timing, **3353**
Norris, R. C., Principles of Electricity Illustrated (B), **3596**
Norton, L. D., sound recording in business, **(A) 1754**
Nucci, P., magnetic screening of telephone transformers, **3429**
Null, M. R., with others, arcs for television lighting, **3084**
Nylander, A. L., instrument bearing friction, **3669**

O

Oakes, W. G., with J. G. Powles, v.h.f. dielectric properties of polythene, **2937**
Obreimoff, I., refractive index and thickness of thin films, **2538**
Obukhov, A. M., atmospheric turbulence, **2563**
Ockenden, F. E. J., Introduction to the Electron Microscope (B), **3718**
—— and D.C. Gall, electrical measuring instruments, **3351**
Odarenko, T. M., r.f. cable manufacture, **(A) 2130**
Offner, F., electroencephalographs, **1306**
Ogg, A., geomagnetic activity 1941/45, **1835**
Ogg, R. A., Jr, dielectric properties of metal-ammonia solutions, **3588**
Ol, A. I., with M. N. Gnevishev, solid angle of corpuscular radiation, **2555**
Oliver, M. H., with L. Essen, aerial impedance measurements, **283**
Oliver, R., with L. H. Ford, reflection and absorption of 9-cm waves, **2673**
Olsen, J., solar-diurnal period in geomagnetic field, **2894**
Olsen, L. O., C. S. Smith and E. C. Crittenden, Jr, metal evaporation techniques, **940**
Olson, H. F., gradient microphones, **827**
Oman, N. J., exciter for f.m. transmitter, **2380**
Omberg, A. C., and W. L. Webb, aircraft position plotter, **(A) 1523**
O'Neill, G. D., tunable magnetron, **2396**
Onslow, D. V., with T. H. Messenger, Capacity Current Heating (B), **1959**
Opitz, G., standard-Q coils at h.f., **3774**
Orchard, H. J., with I.F. Macdiarmid, transmission line formulae, **2476**
Ortusi, J., diffraction and reflection of guided waves, **3172**
Osborne, H. S., f.m. and television transmission networks, **738**
Osborne, S. L., and H. J. Holmquest, Technic of Electrotherapy and its Physical and Physiological Basis (B), **1021**
Osborne, W. E., applications of mine detectors, **3711**
Oster, F., S. L. Ch'u and L. Y. Lü, cosmic radiation, asymmetry and absorption, **3274**
Oster, G., electrical research in U.S.S.R., **495**
Oster, H., with others, tropical moisture and fungi, **1876**
Ott, H., saddle-point method in e.m. theory, **1024**
Otto, K., with O. Henkler, amplitude and phase modulation, physical basis, **3461**
Overacker, H. E., with others, u.h.f. receivers, **(A) 1649**
Overbeck, C. J., American developments in physical science, **3073**
Övergaard, T., century of radio technics, **3047**
Owen, D., Alternating Current Measurements at Audio and Radio Frequencies (B), **2984, 3685**
Oxley, J. M., diathermy, **1610**

P

Pacent, L. G., with E. H. Greibach, inertia throat microphones, **(A) 1754, 2122**
Packard, C. A., Relay Engineering (B), **2356**
Padgett, E. D., Simon radioguide d.f., **3294**
Paganelli, I., with others, radar for aircraft fire-control, **(A) 1528**
Page, L., magnetic aerial, **3545**
—— and N. I. Adams, Jr, space charge between coaxial cylinders, **485**, in magnetron, cylindrical, **3478**, plane, **3477**
Page, R. M., radar model XAF, **(A) 1528**
Paine, R. C., complex tanh and coth charts for line problems, **549** ; transmission line charts, **1183, 2479**
Pakswer, S., and J. Kirk, colour temperature measurement, **2275**
Panetti, M., with A. Pinciroli, e.s. field plotting, **3332**
Pannill, C. J., navigating by loran, **3606**
Papalexi, N. D., with L. I. Mandelstam, propagation experiments by interference method, **1638**
Parkash, M., with others, oscillograms of valve characteristics, **2395**
Parker, J. P., with R. Gunn, h.v. characteristics of aircraft in flight, **2722**
Parker, W. L., with R. T. Ellickson, decay of infra-red sensitive phosphors, **3301**
Parker, W. W., dual a.c. network calculator, **47**
Parkins, W. E., with E. C. Crittenden, Jr, betatron beam removal, **3438**
Parmenter, R. L., with E. F. Crowell, 2-m amateur transmitter, **2378**
Parnum, D. H., biological amplifiers, **45, 296, (D) 862**, noise in, **44** ; contrast expansion, **(D) 1793** ; valve vectors, **249**
Parodi, M., theory of coupled circuits, **2591** ; transmission-line theory, **2471**
—— and F. Raymond, transmission-line theory, **2473**
—— with S. Colombo, transients in transmission lines, theory, **550**
Parzegian, V. L., ionization chamber pulse amplifiers, **1494**; high-speed recording potentiometer, **(A) 1576**
Parsons, S. J., with others, cosmic noise at 64 Mc/s, **3370** ; r.f. cosmic-ray fluctuations, **3599**
Parthasarathy, S., theory of light scattering, **1222**
Paschkis, V., and M. P. Heisler, electrical analogy to heat flow **2469**
Patchett, G. N., mixing crystal microphones, **1169** ; nonlinear bridges as voltage stabilizers, **867, 2494**
Patterson, G. K., with A. Alford, modulation circuit, **(A) 1546**
Paul, L., and T. J. Wang, betatron pulsing system, **1211**
Paul, R. H., transmission-line theory, **2474**
Paulson, K. A., with G. Borelius, amorphous and crystalline selenium, **[illegible]**
Pawsey, J. L., R. Payne-Scott and L. L. McCready, solar noise, **1883**
Payne-Scott, R., with others, solar noise, **1883**
Peachey, F. A., S. D. Berry and C. Gunn-Russell, portable precision amplifier-detector, **2644**
Pearsall, C. S., with others, electron capture and t.r. switch recovery, **(A) 3818**
Pearson, H. A., and others, midget earphones, **(A) 3534**
Peavey, R. C., low-level ionospheric reflections, **1841** ; scattering of sporadic-E echoes, **1840**
Pelzer, H., with A. E. W. Austen, linear 'curves of best fit', **2960**
Penin, F., mutual perturbations of two loop d.fs., **3284**
Penn, W. S., plastics in h.f. industry, **3642**
Pennypacker, C. H., with D. R. Crosby, r.f. resistors as transmission lines, **1177**
Penrose, R. P., with B. Bleaney, microwave absorption spectrum of ammonia, **2822, (C) 3237**
Pensak, L., with D. W. Epstein, c.r. tubes, with metal-backed screens, **(A) 1730, 2403**
Pepperberg, E. L., Q of capacitors, chart, **49**
Perfect, D. S., and R. M. J. Withers, photoelectric timing of moving body, **2961**
Perkins, G. D., and H. G. Burnett, construction of line oscillators, **3103**
Peroni, B., Antenne e Propagazione delle Onde Elettromagnetiche (per ingegneri) (B), **859**
Peshkoff, V., stability of autoregulation, **2784**
Peters, F. P., beryllium as alloying metal, **3626**
Peters, R. G., a.m. broadcast transmitters, **2747** ; colour television, **(A) 1708** ; f.m. ratio detectors, **574** ; multi-channel aircraft-ground transmitter, **2752** ; proximity fuse, **625** ; radar countermeasures, **1061**
Peterson, A., standardizing signal generator output, **3357**
Peterson, A. D., machine gun rate-of-fire indicator, **1015**
Peterson, A. P., with H. E. Renfro, f.m. telemetering system, **136**
Peterson, G. E., with others, frequency characteristics for hearing aids, **(A) 3538**
Peterson, H. O., frequency-measuring system, **369**
—— and others, comparison of frequency-shift and on-off keying, **2308**
Petraglia, F. A., (Ed.), Electronic Engineering Master Index (B), **2158, 3156**
Petrashen, G. I., oscillation of elastic sphere, **109**
Pett, C. E., Jr, gramophone amplifier, **2515**
Pettit, J. M., with others, u.h.f. receivers, **(A) 1649**
Pflier, P. M., Electrical Measurements of Mechanical Quantities (B), **706**
Philips, D., pulse-time modulation, **740**
Phillips, E. N., minimum attenuation in waveguides, **1175**
Phillips, H. B., Analytical Geometry and Calculus (B), **3659**
—— with L. A. Ware, electron transit time, **1785**
Phillips, J. W., with others, cosmic noise at 64 Mc/s, **3370** ; r.f. cosmic-ray fluctuations, **3599**
Phillips, M. L., ionosphere as measure of solar activity, **3281**
Phillips, W. E., and C. Probeck, a.m. transmitter design, **2748**
Phyfe, J. D., photocell for theatre sound reproduction, **2806**
Picard, R. G., P. C. Smith and S. M. Zollers, vacuum gauge, **2293**
Pickering, N. C., audio intermodulation measurement, **2641** ; improving gramophone recording, **534**
Pickles, S., blind landing system, **1865**
Pidduck, F. B., Currents in Aerials and High Frequency Networks (B), **1182** ; diffraction theory, **319**
Pierce, J. A., hyperbolic navigation, **(A) 823, (A) 1528** ; loran, **2181, 3237** ; sky-wave transmission and loran, **3190**
Pierce, J. R., electron beams in strong magnetic fields, **1112** ; physical limitations in electron ballistics, **1295**
Piggott, J., measuring insulation resistance, **3667**
Piggott, W. R., square-pulse modulator, **64**
Pike, O. W., U.S. electron tube engineering council, **(A) 1730**
Pinciroli, A., and M. Panetti, e.s. field plotting, **3332**
Pine, C. C., automatic direction finder, **(D) 2914**
Pinney, E., theory of paraboloidal reflector, **1980**
Pinney, L. E., u.h.f. oscillator stability, **973**
Piore, E. R., with others, colour television, **451, 456**
Pippard, A. B., h.f. resistance of superconductors, **3606**
Planer, F. E., toroidal coil winding, **2721**
—— with G. V. Planer, carbon resistors, **1690**
Planer, G. V. and F. E. Planer, carbon resistors, **1690**
van der Pol, B., principles of f.m., **2310**
Polgreen, G. R., applications of radio to measurement, **2650**
—— and G. M. Tomlin, non-destructive testing of materials, **1981**
Polié, B., propagation in valleys acting as waveguides, **3894**
Pollock, H. C., particle acceleration, **(D) 2638**
Polydoroff, W. J., permeability tuning, of aerials, **2493**, of receivers, **578** ; testing loop-aerial receivers, **2484**
—— and A. J. Klapperich, iron dust core permeability, **646**
Pomeranchuk, I., thermal conductivity of dielectrics, **1518**
Pomerantz, M. A., magnetron cathodes, **(A) 1730** ; oxide-cathode emission, **3107**, temperature dependence, **3407, 3408**
Ponizovsky, Z. L., with others, polarization and ionization at half-light, **1641**
Poste, M., technique of e.m. detection and radar, **2890**
Popkin-Clurman, J. R., and B. Schlessel, panoramic reception, **1653**
Poritsky, H., and M. H. Blewett, field determination by overlapping regions, **1571**
Porta, W. L., magnetizer for permanent magnets, **2719**
Porter, N. E., with J. M. Fluke, light-wave communication, **(A) 1866**
Porter, P. A., future of radio engineering in U.S.A., **2660**
Pösch, H., with R. Sauer, integrating machine, **1994**
Posin, D. Q., u.h.f. electrical breakdown in air, **3220, (A) 3673**
Post, R. F., cavitron particle accelerator, **2087**
Postle, A. H., glass-bonded mica, **1267** ; plastics and ceramics, **628**
Potter, N. M., dry batteries, **1696**
Potter, R. K., visible speech, **823, 1465**
Pound, R. V., frequency stabilization of microwave oscillators, **(A) 1576**
—— with others, nuclear magnetic resonance, **1514**
Powel, C. A., engineer in civic affairs, **496**
Powell, T., industrial test equipment, **130**
Power, R. A., magnetophon recording, **2463**
Powles, J. G., and W. G. Oakes, v.h.f. dielectric properties of polythene, **2937**
Prabhakar, P., and V. V. L. Rao, radio power transformers, **753**
du Pré, F. K., with J. L. Snoek, after-effect phenomena and resulting loss, **2323**
Preidel, E. E., with H. Levy, Elementary Statistics (B), **2360**
Priesman, A., graphical analyses of nonlinear circuits, **556**
Prentice, S. A., insulators for the tropics, **1561**
Preston, J. S., galvanometer amplifier with negative feedback, **3670** ; photometry filter using photocells, **3567**
Pretty, C. B., morse recorder construction, **216**
Price, D. J., infra-red emissivity of metals at high temperatures, **3666**
Primakoff, H., with L. L. Foldy, electroacoustic transducer theory, **264**
Pringle, R. W., with others, photoelectric Fourier transformer, **(A) 656**
Pringsheim, P., microanalytic measurement of oxygen production, **968**
Prins, D. G., automatic process control and recording, **1601**
Pritchett, W., feeding combined f.m. and a.m. aerial arrays, **2126** ; measurement of small capacitances, **670** ; neutralization of power amplifiers, **577**
Probeck, C., with W. E. Phillips, a.m. transmitter design, **2748**
Proctor, R. F., and E. G. James, r.f. capacitance and conductance bridge, **676, (A) 1568**
Pullen, K. A., Jr, cathode-coupled amplifier, **2587**
Pulley, O. O., with others, pulse technique for particle acceleration **2087**
Pullin, V. E., X rays in industry, **(D) 196**
Pumper, E. J., supersonic absorption measurements, **2784**
Purcell, E. M., r.f. spontaneous emission probabilities, **(A) 3690** ; wiring in microwave circuits, **(A) 1446**
—— H. C. Torrey and R. V. Pound, nuclear magnetic resonance, **1514**
Purington, E. S., frequency-selective control circuit, **(A) 1490**
Purnell, L. J., analysis of delta network, **860**
Putman, M., with R. T. Rogers, high fidelity a.f. amplifier, **3155**
Pyatnitski, A. M., energy distribution in photocathodes, **(A) 2033, 3782**
Pye, C. R., insulating films, **(AD) 352, (AD) 641**
Pye Ltd., new television system, **230**

Q

QST, radio in U.S. Navy, **417** ; standard frequency transmissions, **1580**
Quance, F. R., with H. B. Seabrook, Canadian s.w. transmitter, **3196**
Quarles, D. A., radar systems considerations, **(A) 1547, 2195**
Quarles, L. R., transmission lines as filters, **2480**, as impedance transformers, **2820**, as resonant circuits, **2478**
—— and W. M. Breazeale, range of radar sets, **3607**
Quarrington, C. A., Modern Practical Radio and Television (B), **2759**
Queen, I., electrically equivalent valves, **798** ; f.m. carrier stabilization, **2765, 3104** ; postwar sound recorders, **590** ; u.h.f. amateur transmitter, **2469** ; u.h.f. transceiver, **2678** ; 144 Mc/s receiver, **1655, 1723**
Queffelec, J., frequency of valve oscillators, **570**

de Quervain, A., with R. Schüpbach, u.h.f. technique developments, 3361
Quill, J. S., measurement of switching-arc duration, 142
Quinn, C. E., with others, contact-modulated d.c. amplifier, 2629
Quirk, A. L., and H. D. Hall, a.c. null indicator, 672
Quirk, C. J., low-frequency multivibrators, 884

R

Rabi, I. I., Science in Progress (B), 1233
Rabinovitch, F., integration of second order differential equations, 3334
Rabuteau, M. G., evolution of long-distance communications technique, 1048
Race, H. H., and A. M. Ross, Jr, high-altitude testing of ignition cables, 207
Radiophare. See Wireless World
Radley, W. G., non-ferrous corrosion in cables and wires, 806
Raether, H., with W. Kranert, cold working of metals, 955
Ragan, G. L., r.f. cable losses, (A) 2130
Ragazzini, J. R., noise in receivers, 1039
Rakshit, H., and K. K. Bhattacharyya, RC oscillator, 1796
Ramaswamy, S., medium-wave ground absorption in India, 712
Ramberg, E. G., with J. Hillier, defects in electron microscope objectives, (A) 3385
—— with others, Electron Optics and the Electron Microscope (B), 1060, [illegible]
Rambo, S. I., a.f.c. for r.f. heating, 1936
Ramm, A. C., microwave oscillator tubes, (A) 2083
Rand, P. S., converting 112 Mc/s equipment for 144 Mc/s, 469 ; lighthouse valve transmitter, 473, 2065
Randall, J. T., magnetron, development, (A) 2084, 2781, and radar, 3812
—— and M. H. F. Wilkins, phosphorescence, 1808
Rank, D. H., modified Rayleigh scattering in a liquid, 2867
Rankin, J. C., high-level detector, 2682
Rao, V. V. L., Decibel Notation and its Applications to Radio Engineering and Acoustics (B), 1141
—— with P. Prabhakar, radio power transformers, 753
Rapuano, R. A., with others, microwave linear accelerator, (A) 3788
Rattray, A., f.m./a.m. receiver, 718
Ray, K., and N. D. Sengupta, theory of diffusion pumps, 1869
Rayleigh, Lord, Theory of Sound (B), 842
Raymond, F., transmission-line theory, 2472
—— with M. Parodi, transmission-line theory, 2473
Raymond, R. C., and W. Webb, radiation resistance of loaded aerials, (A) 3183
Rayner, G. H., exhibition of electrical instruments, 1289
Rayski, G., divergence-free quantum mechanics, 2861
Read, J. C., high-power rectifiers for transmitters, 205, (A) 1073, (A) 2020
Reboul, G., formation of ions and neutral centres in gases, 586
Recknagel, A., resolving power of self-emission electron microscope, 1011
Reddish, W., with W. Jackson, high permittivity crystalline aggregates, 633
Rademske, R. F., shutter tester, 1632
Redshaw, S. C., electrical strain gauges, 3368
Redston, G. D., and J. E. Stanworth, alloy for glass sealing, 1553
Reed, M. B., T- and π-network equivalent formulae, 866
Reekie, J., with T. S. Hutchison, magnetic susceptibility measurement, 3664
Rees, A. L. G., with M. P. Lord, phosphors, decay characteristics, 2594, ZnS, with periodic excitation, 2593
Rees, W. M., fiberglas sound insulation, 1430 ; shipyard calibration room, 523
—— and R. B. Taylor, acoustic properties of fiberglas, 1156
Reeves, J. J., television studio equipments, (A) 1704
—— with others, colour television, 452
Regener, V. H., decade counting circuits, (A) 1581, 2497 ; directly coupled pentode trigger pairs, 2496
Reich, H. J., Theory and Applications of Electron Tubes (B), 252
Reiches, S. L., loudspeaker testing, quarter-wave method, 267
Reilly, J. E., and C. E. Valentine, voltage regulator, (A) 2014
Reilly, L. A., doubling transmitter power, 239
Reimann, A. L., coppered-tungsten-to-glass seals, 2591
Reimert, L. J., photoelectric properties of finely-divided metals, 2921
Reinsmith, G., preparation of specifications, 3145
Reiskind, H. I., multi-speaker sound-film reproduction, 2
Reisman, S. J., with others, fire-control radar, 610, 1250, 1534
Reiss, J., teleion gas relay, 802
Relson, M., direction finder, using f.m., (A) 1254
Renfro, H. E., and A. P. Peterson, f.m. telemetering system, 136
Rentzel, D. W., aviation communication systems, 604 ; electronics in aviation, 155
Repkova, O. N., with G. V. Spivak, plasma behaviour in magnetic fields, 3577
Replogle, D. E., manufacture and use of glass bonded mica, 2219
ReQua, F. L., resistance and capacitance of short cylindrical conductors, 766, (D) 2342
Rettinger, M., and K. Singer, frequency response in sound recording, 3087
Reynolds, F. W., with R. E. Graham, synthesis and evaluation of television images, 1090
Rhita, N., r.f. power supplies, 3079
Ribaud, G., and M. Leblanc, form factor of induction ovens, 2270
Rich, S. R., torsional magnetostriction gramophone pickup, 2451
Richards, P. I., matrix filter theory, 1467
Richards, S. H., technical education and training, 1127
Richardson, H. W., electrical progress and development at G.E.C., 3486
Richardson, W. D., and P. H. Walker, B.B.C. mobile transmitters, 466
Richter, H., with H. Geffcken, Die Photozelle in der Technik (B), 784
Ricketts, R. E., u.s.w. medical probe, 183
Ridenour, L. N., radar in war and peace, 2577
Ridgeway, J. W., valve standardization, 3110
Riesz, R. R., and L. Schott, c.r. tube for visible speech, 3520
Riordan, N. F., steady-state operational calculus, (D) 3329
Rittner, E. S., Pirani gauge, 1552
—— with others, electrolytic selenium photocell, 2034 ; photo behaviour of thallous sulphide, (A) 3624
Rivlin, R. S., orientation of quartz crystals, 338
—— and H. P. Rooksby, X-ray spectrometer, 3058
Robbiano, P., radar countermeasures, 1060, 1527
Robbins, L. L., cathode-ray burns, 1129
Roberds, W. M., design of h.f. heating equipment, 2994
Roberts, A., Y. Beers and A. G. Hill, f.m. for physical measurements, (A) 3347
Roberts, F. F., and J. C. Simmonds, multichannel pulse communication systems, 183, 416, (D) 1676, (D) 2707, (D) 3054, (A) 3742 ; pulse modulation nomenclature, 1351
Roberts, H. W., Aviation Radio (B), 1256
Roberts, J. E., secondary electron effect in radiography, 3000
Roberts, L. D., with others, split-anode magnetrons, 100-800 Mc/s, (A) 3479
Roberts, R. S., with W. J. Tucker, Plastics for Electrical and Radio Engineers (B), 1896, 2952
Roberts, S., conjugate-image impedances, 1784
van Roberts, W., f.m.-a.m. conversion at u.h.f., (A) 3025
Roberts, W. A., l.f. frequency meter, 2976
Roberts, W. van B., rhombic and V aerials, 2438 ; rotary wave radar, 2908
Roberts, W. O., photoelectric sight for solar telescope, 2656
Robertson, D., biological amplifiers, (D) 362
Robertson, L. M., electrical apparatus at high altitudes, 515
Robertson, S. D., and A. P. King, u.s.w. propagation in rain, (A) 1636, 1972
Robins, J., and L. E. Varden, photocell control for colour printing, 2358
Robinson, A. K., umbrella aerial, 2145
Robinson, F. E., magnetic materials, 1270
Robinson, H., and M. C. Flanagan, thermocouple vacuum gauge, 2919
Robinson, J., high-speed telegraphy and fading, 188
Rocard, Y., Théorie des Oscillateurs (B), 591, 2859 ; waveguides, 3174
Rock, S. M., with others, computer for simultaneous equations, 1927
Rod, R. L., aerial navigation aids, 1547 ; pulsing circuits for timing, 2152
Rodda, S., beam tetrodes, 2091, 3118, 3119
Roddam, T., high-speed telegraphy and fading, 188 ; low-pass filter design abacs, 52, (C) 869
Roe, G. M., waveguide theory, (A) 2135
Roess, L. C., electronic control in oil engineering, 3699 ; measurement of thermocouple output, (A) 558
Rogers, E. H., with others, electrification of aircraft, 1993
Rogers, G. F., isolation amplifiers for aircraft, 3738
Rogers, R. T., and M. Putman, high fidelity a.f. amplifier, 1255
Rogerson, S., plastics in the tropics, 349
Rohats, N., high-speed oscillograph, 2024
Rohde, S., carrier-current system, 3043
Rohrbaugh, J. H., with J. P. Cooley, production of millimetre waves, 589
Romander, H., 20-kW broadcast transmitters, 2061 ; 200-kW 6-22 Mc/s amplifier, 787
Rommel, T., with others, supersonic degassing of metal alloys, [illegible]
Rooksby, H. P., with R. S. Rivlin, X-ray spectrometer, 3058
Rose, A., television pickup tubes, (A) 3087
—— P. K. Weimer and H. B. Law, image orthicon, (A) 1704, 3085
Rose, M. E., space-charge-limited beams in e.s. fields, (A) 1313
Rosenberg, L. D., with others, sound radiation in water, 1745
Rosenhead, L., with others, Index of Mathematical Tables (B), 3339, 3660
Rosenthal, A. H., projection television equipment, 461
Rosenthal, E., metallizing ceramics, 2945
Ross, A. M., Jr, with H. H. Race, high-altitude testing of ignition cables, 207
Ross, D. A., with others, frequency characteristics for hearing aids, (A) 3538
Ross, H. A., i.f. transformers for f.m. signals, 2831
Ross, W. M., measurement applications of the dynatron, 968
Rossi, B., and N. Nereson, counter discharge time intervals, 2026
Rothschild, K., with P. L. Copeland, spotwelder for thin wires, [illegible]
Rothstein, J., electronic microphone, (A) 1435
Rouse, G. F., with others, vacuum-contained triode transmitter, 1403
Rowed, D. W., with others, equipment deterioration in tropics, 809
Rowlands, R. O., double-derived terminations, 872
Roy, P. B., with others, properties of Indian mica, 1268
Royal Institute of Chemistry, publicity of science, (D) 1119
Royal Society, units and standards, 3341
Roys, H. E., study of disk-recording performance, (A) 1754, (A) 2125
Rozovski, M., field equations for conducting medium with magnetic afteraction, 2544
Rudd, J. B., ten-channel aircraft receiver, 3033
—— and T. R. W. Bushby, military aircraft receiver, 3032
Rudd, W. C., oscillators for induction heating, (A) 1613
Ruddle, F. A., low-distortion diode detector, (D) 1989
Rudenberg, G., h.f. deflexion system, for c.r. tubes, (A) 1111
Rüdenberg, R., earth currents, 29
Rüdiger, O., and H. Schlechtweg, eddy currents in metal sheets, 353
Rudmose, H. W., and others, effect of altitude on speech and hearing, (A) 3523
Rudnick, I., acoustic transmission through fluid lamina, 817
Ruedy, R., earth-resistivity, 1523 ; light, scattering by water drops, 1506, transmission in water drops, 1505
Rueger, L. J., with others, fire-control radar, 610, 1250, 1534
Rumsam, C. G., induction relay testing, 2981
Runciman, A. S., graphs of capacity and inductance, 2829
Ruschuk, I. M., rhombic aerials, efficiency, 3548
Rushforth, L., with others, cavity magnetrons, 2782
Russell, O. J., post-war television, 458
Rutherford, R. E., with others, mobile television equipment, 460
Rutledge, O. C., protective packaging, 2104
Ruze, J., design of broadside arrays, (A) 1448
Rycroft, J. L., with others, control of electrical twinning in quartz, 1874 ; radiant and h.f. heating, 145, (A) 995, (D) 2268
Rydbeck, O. E. H., forced oscillations in spherical resonators, 320 ; ionospheric propagation, 709 ; Kerr modulator for ionosphere recorder, 2049
Ryder, J. D., ferroinductance as variable circuit element, 643, (D) 2223
Ryder, L. L., television studio equipment, (A) 3087
Ryerson, C., and M. Aronson, transient peak voltmeter, 121
Ryle, P. J., steel towers for transmission lines, (A) 3067
Rytoff, S. M., nonlinear oscillation problems, 106 ; parametric vibrations in magnetic field, 2546, 2880

S

Sabaroff, S., link-coupled coil design, 3199
Sacerdote, G., equivalent circuit of spherical vibrator, 3160
Sachs, K., and W. G. Noack, h.f. and communications engineering, 3745, 3746
Sachs, R. G., theory of crystal counters, (A) 3629
Sack, S. L., f.m. transmitter, 1722
—— with M. B. Kahn, f.m. transmitter, 2064
Sadowsky, M. A., oscillatory equations for nonlinear springs, 863
Saha, A. K., theory of β-ray spectrometer, 1231
Saha, M. N., and B. K. Banerjea, wave propagation theory, ionosphere, 3720
Saha, N. C., h.f. induction furnace, 998
Sahay, B. K., supersonics, corpuscular nature, 904
Salisbury, W. W., high-power v.h.f. valves, 3115 ; resnatron, 1788
—— with others, u.h.f. c.w. power generation, (A) 1715
Salmon, V., generalized plane wave horn theory, 828 ; new family of horns, 829
Samuel, A. L., electron ballistics in h.f. fields, 1396, 2777
—— J. W. Clark and W. W. Mumford, gas-discharge t.r. switch, 2783
Sanders, R. C., Jr, and others, f.m. altimeter, (A) 1528
Sands, L. G., valve tester, 381
Sanial, A. J., electric megaphone, acoustic feedback, 17, microphones for, 1756
Sargeant, W. E., with others, contact modulated d.c. amplifier, 2629
Sarna, H. R., with others, oscillograms of valve characteristics, 2395
Sass, S., with C. Marton, bibliography of electron microscopy, 1006
Sather, O. J., CBS television [illegible], 2878
Sauer, R., and H. Pösch, integrating machine, 1904
Saunders, F. A., mechanical action of violins, 840
Saunders, L. A., phase splitter, 881
Sauter, F., wave mechanics representation of electric field, 903
Savage, R. H., carbon brush contact films, 340
Saw, P. D., television production test gear, 380
Sawyer, C. B., with R. S. Lamer, sonar, 1750
Saxon, D. S., electron beam tuning of cavity oscillators, (A) 3825
—— and J. Schwinger, electron orbits in synchrotron, (A) 3787
Saxon, M., heterodyne frequency meter, 2252
Saxton, J. A., with J. S. McPetrie, electrical properties of soil at λ 2 and 5 m, (A) 711, (A) 1022 ; linear aerials, 1450
—— with others, half-wave aerial with V reflector, (A) 291, (A) 3190
Say, M. G., with others, "Electrical Engineer" Reference Book (B), 1140
Scandurra, A., and S. Stiber, visual indication d.f., (A) 1528
Scanlon, W. W., with others, electrical properties of germanium alloys, 2216
Schaaf, S. A., cylinder cooling problem, 1507
Schade, O. H., television system characteristics, (A) 1704
Schäfer, O., limiting sensitivity of energy-detecting devices, 166
Scheldorf, M. W., circular aerials, (A) 2143
Schelkunoff, S. A., Hallén's equation for aerials, 851, (D) 2141 ; linear and slightly nonlinear differential equations, 1570 ; principal and complementary waves in aerials, 852
Scherbatskoy, S. A., and R. E. Fearon, e.s. voltmeter for small e.m.fs., 3352
Scherman, D. I., diffraction of elastic waves, 1906
Scherrer, P., and B. Matthias, piezoelectric crystals in wave filters, 3196
—— with others, wide-band crystal filters, 579
Schiff, L. I., noise in radar crystal detectors, (A) 3725 ; production of particle energies beyond 200 MeV, 1311
—— with others, electrical contact noise, 3263 ; h.f. rectification efficiency of crystal detectors, (A) 3636
Schifferes, J. J., with F. R. Moulton, Autobiography of Science (B), 2109
Schiller, K. K., test of significance, 3492
Schindler, W. G., engineers in naval research, 1117
Schlechtweg, H., with O. Rüdiger, eddy currents in metal sheets, 353
Schlesinger, K., cathode-follower circuits, 875 ; single-carrier television, (A) 1704
Schlesinger, K., with others, television sound transmission on vision carrier, 1382
Schlesman, C. H., and F. G. Brockman, a.c. bolometer for infrared spectroscopy, [illegible]
Schlessel, B., aith J. R. Popkin-Clurman, panoramic reception, 1653
Schneider, E. E., phase inversion for resonance, 1207
Schneider, E. G., radar, 3285
Schock, R. E., with others, comparison of frequency-shift and on-off keying, 2306
Schoenfeld, M. D., (Ed.), Encyclopedia of Substitutes and Synthetics (B), 2231
Schönberg, M., classical theory of point electron, 3175
Schott, J. T., Lookator cable tester, 429
Schott, L., with R. R. Riesz, c.r. tube for visible speech, 3520
Schremp, E. J., generalization of Nyquist's theorem, (A) 2300 ; minimum noise amplifiers, (A) 3556 ; linear network theory, (A) 2150
Schroeder, A. C., with G. C. Sziklai, electronic spectroscopy, (A) 1310
—— with others, television sound transmission on vision carrier, 1382
Schulman, D., facsimile synchronizers, 1709
Schulman, J. H., with others, electrolytic selenium photocell, 2034
Schultz, H. L., high speed counter for nuclear particles, (A) 3761
Schulz, R., frequency modulation, 1050
Schulze, A., aluminium alloys as conductors, 344 ; resistance materials, 3321
Schulze, R., and B. Zeisz, contacts for Al and Mg conductors, 945
Schumb, W. C., sulphur hexafluoride, (A) 3777
Schüpbach, R., 75-cm beam transmission, 3415
—— and A. de Quervain, u.h.f. technique developments, 3361
Schutz, G. C., with E. A. Blasi, radar field maintenance test equipment, (A) 1576
Schwager, A. C., and P. Y. Wang, transmission-line diagrams, 548, (D) 2137
Schwinger, J., equivalent circuits for waveguide structures, (A) 1448
—— with D. S. Saxon, electron orbits in synchrotron, (A) 3787
Scolnik, R., with others, quartz-crystal units, (A) 1576
Scott, C. F., with others, development, in design engineering, 2096, materials, [illegible]
Scott, F. S. G., absolute bels, 2436
Scott, G. G., with others, contact-modulated d.c. amplifier, 2629
Scott, G. W., Jr, industrial dielectric heating, 150
Scott, H. H., measurement of a.f. distortion, 2253
—— and W. F. Byers, amplifier and null detector, 2694
Scott, J. L., Marconi aircraft radio equipment, 288
Scott, M., 6-channel c.r.o. recorder, 3073
Scott, R. F., amateur transmitter-receiver, 3098 ; handie-talkie, 3449
Scott, R. G., with others, electron microscope replica techniques, 1006
Scott, W. E., geomagnetic activity, 1945, 1836, 2565 ; geomagnetic storm, March 1946, 2570
Scott, W. J., glass-to-metal seal design, 97, 3618 ; water jet analogue of klystron, 3473
Scoville, M. E., with F. M. Clark, Lectronol for induction-heater capacitors, 636, (D) 2220
Scoville, R. R., and W. L. Bell, noise-reduction systems for sound films, 273
Scowen, F., Introduction to Theory and Design of Electric Wave Filters (B), 1806
Scroggie, M. G., Decca navigator, 1848, stations, 3696 ; distortion definitions, 1338 ; phase relationships, (D) 2519 ; wave analysis applied to RC circuit, 368 ; see also M.G.S. under Anon.
Scully, C. T., with P. K. Chatterjea, d.c. amplifier coupling, (A) 1185
Scully, J. F., photocell amplifier, 39
Seabrook, H. B., and F. R. Quance, Canadian s.w. transmitter, 3106
Sealy, E. H., First Guide to Quality Control for Engineers (B), 3507
Seaman, E. F., adapting shipboard equipment to war conditions, 860
See, H. P., with R. E. Shelby, field television, 2371
Seeley, S. W., discriminators for f.m. receivers, (A) 1462 ; f.m. ratio detectors, 574 ; shoran, (A) 1847, 2193
Seitz, F., principles of semiconductors, 346
Seitz, H. J., broadcast engineer, duties, 2102 ; microphones, survey, 3186
Selby, M. C., with others, quartz-crystal units, (A) 1576
Selgin, P., effect of coil Q on filter design, 56
Sella, G., Schering bridge sensitivity, 3676
Selvidge, H., proximity fuse for shells, 1827
Sen, B. M., [illegible] classical theory of photon and electron, 906
Sengupta, N. D., with K. Ray, theory of diffusion pumps, 1869
Senior, D. A., high-speed photography of explosions, 2439 ; stroboscope circuit, 2785
Serin, B., semiconductors and contact rectification, 2217 ; energy [illegible] of impurity levels, (A) 3316
—— with others, contact p.d. in barrier-layer rectifier, 1519, (C) 2179
Serrell, R., u.h.f. television transmitters and aerials, (A) 1448
Seulen, —., and —. Voss, surface hardening of steel by induction heating, (A) 687
Sevchenko, A. N., luminescence polarization of uranium glasses, 2207
Shackelford, C. L., with others, secondary-emission cathodes for magnetrons, (A) [illegible]
Shackleton, I. W., polyethylene, (A) 2130
Shalowitz, A. L., radio-acoustic ranging in marine surveying, 335
Shalyt, S., thermal conductivity of Bi at low temperatures, 2174
Shanklin, J. P., vectorial treatment of transmission lines, 348
[illegible], W., electronic computers, 3655
Shaper, E. B., magnetic transient recorder, 217 ; pen recorder with [illegible], 1683
Shapley, A. H., short-term ionosphere forecasting, 2563
Sharbaugh, A. H., and R. L. Watters, 1·37-cm communication, 3051
Sharma, O. P., magnetostriction in Ni, 3254
Sharpless, W. M., angle of arrival of microwaves, (A) 1636
Shaw, G. B., supersonic water-depth sounder, 3163
Shaw, G. R., steel-to-glass vacuum seal, 935
Shaw, R. C., high-fidelity amplitude modulator, 475
Shea, H. G., decade counter circuits, 3776 ; f.m. weak-signal suppression, 2291 ; magnetrons, rising-sun, 3114 ; theory and uses, 2402 ; mass production of receivers, 2443 ; vector analysis, 655
Sheffet, D., geophysical prospecting equipment, 798
Sheffield, C. W., television "fallacies", 298
Shelby, R. E., and H. P. See, field television, 2371
Sheldon, F. E., r.f. cable types, (A) 2130
Shenk, E. [illegible], multivibrators, 2180
Shepherd, R. B., pulse modulation, (D) 1676, (D) 2707, (D) 3054
Sheren, C. M., and [illegible], corrosion of lead cable sheaths, 511
Sheridan, C. J., v.h.f. receiver servicing, 1667
Sherman, J. V., with others, The New Plastics (B), 861
Sherman, V. W., r.f. heating in bakeries, 1939
Sherwood, E. A., types of small mains transformers, 1069

Shifrin, K., theory of semiconductors, 2218
Shirokov, M. F., sound field of moving sound sources, 2793
Shive, S. L., resistance measurement at high impulse voltages, 669 ; screening tester, 1680
Shklovsky, J. S., radiation from solar corona, 2860
Shore, S. X., aging of quartz crystals, 685 ; crystal-controlled receivers, 578 ; crystal oscillators in v.h.f. receivers, 170
Shortley, G. H., and A. May, coil for constant magnetic gradients, 1082
Shotter, G. F., meter and instrument jewels and pivots, (A) 3423
Shuart, G. W., parasitics in 28-Mc/s amplifier, 2772
Shunaman, F., nomograph construction, 2830, 3332 ; pulse-position modulation, 1677
Siegbahn, K., and N. Svartholm, β-ray focusing by magnetic field, 2873
Silberstein, R., with N. Smith, ionospheric forecasting, 2285
Sillars, R. W., with others, non-ohmic resistors, (A) 1985, (A) 2606
Silver, M., multimeter with h.f. voltmeter, 1601
Silverman, H., c.r. tubes, aging timer, 1698, uniformity in production, 251
Simard, G. L., C. J. Burton and R. B. Barnes, electron diffraction, 1006
—— and J. Steger, NaCl-to-glass seal, 2205
Simmonds, J. C., balanced cable measurements 10-200 Mc/s, 667, (A) 1913 ; electric intensity near aerial cage, 3184
—— with F. F. Roberts, multichannel pulse communication systems, 183, 416, (D) 1676, (D) 2707, (D) 3054, (A) 3742 ; pulse modulation nomenclature, 1351
—— with others, power loss in e.m. screens, 1077
Simmons, E. C., new oscilloscope design, 3677
Simon, A. W., measuring mutual inductance and capacitance, 3666 ; tracking permeability-tuned circuits, 3224 ; universal coil winding, 773, 1065, 1701
Simon, I., cm-wave permeability of Ni, 2924
Simon, L. E., preparation of specifications, 3147
Simonds, H. R., M. H. Bigelow and J. V. Sherman, The New Plastics (B), 963
Simons, A. H., continuous recording camera for oscilloscopes, 761
Simson, V. J., glass-sealed capacitors, 212
Sinclair, G., E. W. Vaughan and E. C. Jordan, model aircraft aerial measurements, (A) 1448
Singer, C. H., preventive maintenance for broadcast stations, (A) 2319, 2709, 3055, 3422
Singer, K., with M. Rettinger, frequency response in sound recording, (A) 3067
Singh, B. K., supersonic velocity in water, 2449
Siocos, C. A., power loss in e.m. screens, 2716
Sixtus, K., initial permeability and elastic stress, 354
Skaggs, L. S., and others, removal of electron beam from betatron, 3439
Skanavi, G. I., with B. M. Vul, h.f. ceramic capacitors, 3779
Skillman, T. A., carrier-current equipment, 1046
Skillman, T. S., filter circuits with back-coupled amplifier, 566 ; thermostatic oven design, 758
Skinner, E. E., radar indicators, 616
Slack, C. M., and D.C. Dickson, microsecond radiography, (A) 1613
Slack, M., randomly phased sinusoidal oscillations, 1966, (A) 2962
Slater, J. C., with others, microwave linear accelerator, (A) 3788 ; superconductivity of lead at λ 3 cm, 3258
Slätis, H., method of investigating magnetic lenses, 2276
Slaymaker, F. H., W. F. Meeker and L. L. Merrill, vibrations of free-edge disk in baffle or horn, (A) 3512
Sleeper, H. P., Jr, with L. L. Beranek, anechoic sound rooms, 3539
Smith, A. D., Jr, h.f. wobbulator, 1694
Smith, A. E., with others, electron microscopy, 1950
Smith, A. W., F. P. Dickey and S. W. Foor, h.f. permeability of iron, 96
Smith, A. W., J. H. Gregory and J. T. Lynn, r.f. resistance of iron wire and permalloy strip, 1266
Smith, C. E., Applied Mathematics for Radio and Communication Engineers (B), 112
Smith, C. G., electron liberation in mercury arc, 1815
Smith, C. S., with others, metal evaporation techniques, 946
Smith, D. B., U.S. television standardization, (A) 1278
—— and W. E. Bradley, impulse noise in f.m. receivers, (A) 1049
Smith, D. H., method of obtaining mechanical vibrations, 582
Smith, E. W., developments in radar cables, 1704
Smith, F. W., Jr, and P. K. Stumpf, supersonic generator, 1746
Smith, H. M., CBC international short-wave station, 193
Smith, J. C., with others, f.m. altimeter, (A) 1528
Smith, J. E., signal/noise ratios in multiplex systems, 2696
Smith, J. G., and A. J. Duncan, Sampling Statistics and Applications (B), 812
Smith, L. W., a.f. distortion measurement, 117
Smith, N., and R. Silberstein, ionospheric forecasting, 2285
—— with J. H. Dellinger, sky-wave propagation during war, (A) 1626
Smith, P. C., with others, vacuum gauge, 2263
Smith, P. H., clover-leaf f.m. aerial, (A) 2143
Smith, P. I., plastics in the tropics, 349
Smith, P. V., with E. Stanko, theatre servicing test equipment, (A) 3067
Smith, R. A., radar for civil aviation, 1859, radar navigation, 1949
Smith, R. N., contact capacity of crystal rectifiers, (A) 3631
—— with others, d.c. characteristics of crystal rectifiers, (A) 3630
Smith, W. W., class-C grid modulation, 2379, 2763 ; clipped modulation, 1724
Smith-Rose, R. L., radar principles, 1852 ; solar eclipse, and ionosphere, 2562, and propagation, 1945, 1831, (A) 3277
—— and H. G. Hopkins, u.h.f. d.f. for radiosonde, 1864
Smullin, L. D., gas discharges in t.r. switches, (A) 3819
—— with T. S. Ke, t.r. switches, (A) 3814
Smyth, C. N., total emission damping, 3109
Snoek, J. L., and P. K. du Pré, after-effect phenomena and resulting loss, 2828
Snow, W. B., and A. R. Soffel, stereophonic sound-film recording equipment, 9
Snowdon, S. C., multivibrator theory, (A) 1796
Snyder, C. J., with L. F. Hickernell, lead alloy for cable sheathing, 3647
Sobolef, S. L., near periodicity of wave equation solutions, 1901, 1902, 2615
Soffel, A. R., with W. B. Snow, stereophonic sound-film recording equipment, 9
Soh, H. P., M. H. Wang and S. C. Kiang, relative nature of e.m. radiation, 2868
Sohon, H., Engineering Mathematics (B), 2236, 2237
Sokolov, S. P., with others, polarization and ionization at half-light, 1641
Sollima, M., microfilm, 3506 ; modulation meter, 2683
Sommer, A., colour response of emissive photocells, 437
Sommer, W., electric eye *vs* human eye, 2361 ; electronic applications in U.S. industry, 218 ; step-control of productive process, 3488
Sorge, J., electric relays, survey, 3775
Sorokina, V., mechanism of cold-emission kenotrons, (A) 2387
Southwell, R. V., relaxation methods, 2617
Southworth, G. C., microwave solar radiation, 76, (C) 2188
Spahn, E., magnet steels and magnet testing, 861
Spangenberg, K., electron lenses, (D) 1944
—— with others, u.h.f. receivers, (A) 1049
Spears, R. A., gold film electrodes for h.f. quartz plates, 2794
Speight, W. D., 2-metre transmitter, 3457
Spencer, R. S., and R. F. Boyer, thermal transitions in high polymers, 2985
—— with R. F. Boyer, thermal expansion anomaly in high polymers, 496
Sperduto, A., with others, h.v. electrostatic generator, (A) 3777
Sperry Gyroscope Co., microwave blind landing system, 1955
Spicer, W. T., blind landing radar system, 2615
Spilsbury, R. S. J., and A. Felton, photocell inspection of cartridge cases, 1616
—— and C. E. Webb, calibration of Grassot fluxmeters, 373
Spitzer, E. E., grounded-grid power amplifiers, 2985 ; induction heating in valve manufacture, 1615
Spivak, G. V., and O. N. Repkova, plasma behaviour in magnetic fields, 3577
Spooner, A. M., c.r. tube quality measuring apparatus, 3683
Springer, C. C., 6-V d.c. supply, 2350
Sproull, R. L., pulse emission characteristics of oxide cathodes, (A) 244, (A) 797
—— and E. G. Linder, resonant-cavity measurements, 2240
Sproull, W. T., X-Rays in Practice (B), 3716
Sprungman, O. I., receiver repair insurance, 3503
Squire, C. F., with others, superconductivity of lead at λ 3 cm, 3258
Stäger, H., and F. Held, h.f. hardening of plastics, 1001, 3696
Stamm, A. J., with R. C. Weatherwax, electric resistivity of resin-treated wood, 1269
Standard Oil Development Co., Future of Industrial Research (B), 1138
Standard Telephones & Cables, wartime work, 3135
Stanko, E., and P. V. Smith, theatre servicing test equipment, (A) 3067
Stanley, A. W., loudspeaker output stage, 3727
Stannett, A. W., with E. D. Humphries, dipole theory of dielectrics, 585
Stanton, L., parallel-T RC networks, 2840
Stanworth, J. E., with G. D. Redston, alloy for glass sealing, 1553
Steele, H. C., Jr, with others, secondary-emission cathodes for magnetrons, (A) 1730
Steele, H. K., electronic control in food industry, 3699
Steger, J., with G. L. Simard, NaCl-to-glass seal, 2205
Steger, W., applications of ceramics, 3326
Steinberg, J. C., contrast expanders for sound films, 10
—— and N. R. French, portrayal of visible speech, 3516
Stephen, J. L., nomogram for inductance of straight wires, 2146
Stephens, W. E., crystal rectifiers, 3108
—— B. Serin and W. E. Meyerhof, contact p.d. in barrier-layer rectifier, 1519, (C) 2179
Stevens, C., cathode follower for power amplifier, 3206
Stevens, S. S., J. Miller and I. Truscott, masking of speech, (A) 3527
Stevenson, A. R., Jr, with others, curricula of U.S. engineering colleges, 1124
Stevenson, D. A., telecontrolled fog signals, (A) 1862
Stevenson, M. H., Australian a.m. broadcasting station, 240
Stewart, C., Jr, coaxial cable attenuation measurement, 666, (A) 2130, (D) 2942 ; dummy aerial for aircraft radio tests, 343 ; measurement of h.f. resistance of wires, 367
Stewart, J. L., supersonic interferometer, 1749
Stewart, T. E., non-metallic mine detector, 700
Stiber, S., with A. Scandurra, visual indication d.f., (A) 1528
Sticher, J., with A. Gemant, crucible failure in induction heating, 695
Stigant, S. A., impedance of multiple-winding transformers, 1665, 2017, 2325
Stimmel, R. G., and others, electrification of aircraft, 1993
Stobbe, J. A., engineering necessities for progress, 1413
Stockman, H., conversion diagrams for triode mixers, 499 ; output from nonlinear mixers, 1492, (A) 1966
Stockman, W., slow-speed relaying, 195
Stoebel, H., radar, 1851
Stoffregen, W., ionosphere during 1942 eclipse, 3187
—— with others, photographic timing, 3353
Stoker, R. L., measurement of fog droplets, 3431
Stokley, J., with others, development in design engineering, 2096, materials, 1558
Stolte, F., with B. Kramer, propagation velocity measurement in cables, 2977
Stolze, W. J., r.f. chokes at u.h.f., 1369
Stone, A. M., and J. L. Lawson, double-tuned circuits, 2152
Stone, R., office recording equipment, 270
Stoner, E. C., demagnetizing factors for ellipsoids, 3251
Storck, H., with A. R. Knight, selective pulse system, 2399
Storm, H. F., induction heating of long cylindrical charges, (A) 1933, 2963
Storrs, E., W. Devitt and B. Green, ground controlled approach, (A) 1528
Stotz, H. M., preparation and publication of I.R.E. papers, 1121
Stotz, E., with J. C. Moyer, electronic blanching of vegetables, 393
Stovold, A. T., with D. W. Cherry, earth currents in short submarine cables, 2895
Straede, J. W., high-fidelity amateur amplifiers, 1440
Strafford, F. R. W., superregenerative detector, 1032, 2661
Strajman, E., Geiger-Müller counter, 3760
Strange, J. W., and S. T. Henderson, cathodo-luminescence, 3940
Stratton, F. J. M., international scientific co-operation, 1116 ; solar noise, 1825
Stratton, J. A., M.I.T. electronics research laboratory, 2416
Straus, H. A., and others, fire-control radar, 610, 1250, 1594
Street, R., investigation of e.s. fields by valve voltmeter, 3572
Stremel, R. A., machine tool control, 1914
Strock, R. O., and E. A. Dickinson, Western Electric recording system, 19
Strohm, W. E., with P. M. Honnell, laboratory for basic electronics, 1416
Strutt, M. J. O., and A. van der Ziel, fluctuation suppression, 2843 ; h.f. dielectric loss in glasses, 949 ; s/n ratio in triode amplifiers at v.h.f., 3740
—— with A. van der Ziel, fluctuation suppression, 2944
Stuart, D. M., omnidirectional range, 2190
Studenkov, E. M., propagation in branched waveguides, 849
Stull, D. R., recorder for resistance thermometer, 379
Stumpf, P. K., with F. W. Smith, Jr, supersonic generator, 1746
Sturley, K. R., frequency modulation, (A) 734, (D) 1051 ; peak pulse currents in class B amplifiers, 3563 ; Radio Receiver Design–Part II (B), 414, 728, 3640 ; sound and vision separation in television reception, 233 ; valve vectors, 249
Sturm, R. E., with others, recorder-controller for temperature and humidity, 3371
Sucksdorff, E., effect of eclipse on atmospheric potential gradient, 2561
Sucksmith, W., with T. A. Margerison, magnetic potentiometer for B-H curves, 3349
Suetin, T. A., with B. L. Granovsky, high-power plasma oscillations, 2572
Sugar, A. C., forced oscillations, 3656
Suharevsky, G. M., sound propagation in air, 1487
Suhrmann, R., and W. Kundt, secondary emission from thin metal films, 939
Sullivan, C. M., amateur transmitter-receiver, 3405
Sulzer, P. G., ionosphere measuring equipment, 2963
Summerford, D. C., field-strength indicator for v.h.f., 3681
Summerhayes, H. R., Jr, f.m. station monitor, (A) 2319
Sun, Y. T., and W. Band, anomalous thermionic emission current, 1513
Suryanarayana, D., with S. Bhagavantam, shear modes in piezo-electric crystals, 684
Sutherland, G. B. B. M., with E. F. Daly, c.r. recording of infra-red spectra, 3373
Sutro, P. J., characteristic impedance of balanced lines, 2817
Svartholm, N., with K. Siegbahn, β-ray focusing by magnetic field, 2873
Swallow, J. C., plastics in scientific instruments, 1567
Swan, A. G., screened room for r.f. heating generators, 3461
Swann, W. F. G., ionization measurement in counters, (A) 3665 ; theory of piezoelectric oscillations, (A) 1295
—— with P. B. Weisz, electron and mesotron ionization in cosmic rays, (A) 3691
Swanson, D. C., ceramic dielectrics, (A) 3318
Swedlund, L. E., television kinescope, (A) 1704
Sweer, J. H., with W. F. Brown, Jr, fluxball magnetic test coil, 974
Sykes, R. A., quartz crystal units for communication control, (A) 1700
Sylvania Electric Products, battery-operated a.f. amplifiers, 279
Synge, J. L., reflection of light from corner, 3560
Syxling, H., sound effects circuits, 1151
Szikiai, G. C., current oscillator for television sweep, 3389
—— and A. C. Schroeder, electronic spectroscopy, (A) 1310
—— with R. D. Kell, image orthicon camera, 2374

T

Tai, C. T., transmission line impedance matching, 1178
Tak, W., measurement of reverberation, 3530
Talet, P., Aminoplastes (B), 3649
Tamm, I. E., geomagnetism and ionospheric currents, 2887
Tarpley, R. E., with others, potentiometer recorder, 2349 ; recorder for flight testing and spectroscopy, (A) 1911
Tasker, H. G., technique of film sound recording, 260
Tawde, N. R., and G. K. Mehta, probe method for h.f. discharge study, 1872
Taylor, D. G., and G. Volkenant, electronic aircraft control, 156
Taylor, H. G., with L. B. Hunt, electrical contact springs, (D) 3061
Taylor, J., plastics, 100, 652, 653
Taylor, J. H., with others, fire-control radar, 610, 1250, 1594
Taylor, J. J., quality control of insulator manufacture, 265, (D) 3633
Taylor, M., with others, fire-control radar, 610, 1250, 1594
Taylor, R. B., with W. M. Rees, acoustic properties of fiberglas, 1156
Taylor, R. C., tunable rejection filter, (A) 1787, 2504
Taylor, R. R., broadcast station alarm system, 3441
Taylor, T. A., with others, cm-wave dielectric measurements, 366, (A) 1915
Teal, G. K., J. R. Fisher and A. W. Treptow, bridge photocell, using silicon, (A) 3784
Teece, J. H. H., h.f. induction furnace, (A) 897
Tellegen, B. D. H., with J. L. H. Jonker, current to positive grid in valves, 2087
Temple, R. B., with others, c.r. recording of infra-red spectra, 3374
Teodorchik (Theodorchik), K., Nyquist diagram for regenerative circuits, 2842 ; theory of relaxation oscillatory systems, 111
Terletsky, J. P., charged particles and magnetized cosmic bodies, 75
Terrestrial Magnetism, geomagnetic storms, 2567 ; solar and magnetic data, Jul.–Sept. 1945, 504
Tessier, H., with W. A. Bryce, sealing evacuated tins, 1554
Tessner, S., mechanism of spark formation in gases, 960
Thayer, W. L., multisection re-recording equalizer, 596
Theodorchik. See Teodorchik
Thiede, H., magnetostrictive oscillator coupling, (A) 1147
Thomas, H. P., with others, phase and frequency modulation, (A) 1666
Thomas, L. A., quartz oscillator plates and X rays, 2223
—— J. L. Rycroft and F. A. Fielding, control of electrical twinning in quartz, 1874
Thompson, B. H., and K. N. Mathes, insulation corrosion in tropics, 256
Thompson, E. J., wobbulator signal generator, 3643
Thompson, H. W., with others, c.r. recording of infra-red spectra, 3374
Thompson, R. T., two-frequency i.f. transformers, 3430
Thomson, E. C., 4-colour facsimile transmission, 2737
Thonemann, P. C., h.f. discharge as ion source, 3361
Tiberio, U., Introduzione alla Radiotelemetria (B), 3366
Tillman, J. R., linear frequency discriminator, 3731
Tilton, E. P., a.m.-f.m. 50-Mc/s transmitter, 466, amplifier for use with, 789 ; mobile metre-wave receivers, 3732, mobile 28- and 50-Mc/s transmitter, 3755 ; remote-indicating field-strength meter, 2250 ; superregenerative receiver, 1656 ; 144-Mc/s propagation beyond optical range, 1942
Timofeev, P., rôle of surface charge in valves, (A) 2386
Tinkham, R. J., multiple wire recording, 385
Timms, W. C., and W. H. C. Higgins, naval fire-control radar, 2581
Tomlin, G. M., with G. R. Polgreen, non-destructive testing of materials, 1931
Tooley, L. B., gate circuit for chronographs, 2148
Tooley, M. D., transmitters for d.f. calibration, 337
Topanelian, E., Jr, and N. D. Coggeshall, metal packless vacuum valve, 1258
Torok, J. J., with O. K. Johannson, silicones for water-repellent surfaces, 2214
Torrey, H. C., crystal rectifiers in heterodyne receivers, (A) 1049
—— with others, nuclear magnetic resonance, 1514
Townes, C. H., ammonia microwave spectrum, (A) 3238 ; r.f. cosmic noise, (A) 3598
Transmitter Equipment Mfg. Co., 250-W h.f. f.m. transmitter, 1267
Tranter, C. J., and J. W. Craggs, stress distribution in compressed cylinder, 108
—— with J. W. Craggs, capacity of twin cable, 660, 1446
Travis, E., cathode-coupled a.f. isolating amplifier, 1187
Treakle, L., low voltage broadcast receiver, 2398
Tremaine, H. M., maintenance testing of dynamotors, 2089
Treptow, A. W., with others, bridge photocell, using silicon, (A) 3784
Treskinsky, A., crystal-controlled f.m., 2769
Trimble, L. S., and F. W. Bowden, coloured-trace oscillograms, 2229
Tripp, W. A., e.m. force between moving charges, 587
Trotter, H., Jr, proximity fuse, (A) 1226
Trump, J. G., insulation of high voltages in vacuum, (A) 3675
Truscott, I., with others, masking of speech, (A) 3527
Tsien, L. C., and H. C. Chu, harmonic oscillation of quartz crystal, 471
Tucker, D. G., forced oscillations and synchronization of oscillators, (A) 883 ; transient response of filters, 870, 1186, of tuned-circuit cascades, 3204
Tucker, D. P., radar fire control, (A) 1528
Tucker, W. J., plastics in the tropics, 349
—— and R. S. Roberts, Plastics for Electrical and Radio Engineers (B), 1596, 2968
Tucker, W. S., sound absorption in Helmholtz resonator, 1155
Tugman, J. L., with others, development in design engineering, 2096, materials, 1558
Tuller, W. G., microwave beam aerials, 1457
Tulley, T. J., resistance-temperature coefficient of thin Bi films, 1578
Tupholme, C. H. S., Photography in Engineering (B), 1897
Turner, R. P., amplitude modulation-depth meter, 2979 ; microfarad meters, 978 ; multi-range milliammeter, 1596 ; Radio Test Instruments (B), 1607 ; 28–54 Mc/s transmitter, 1236
Turner, W. E. S., Elements of Glass Technology for Scientific Glass Blowers (B), 2232
Turney, T. H., testing deaf aids, 1441
Tusting, W., ventilation of radio receivers, 1419
Tuttle, W. N., pulse-integrating circuit, (A) 1459 ; series and parallel impedance components, 1208
van der Tuuk, J. A. (J. H.), Rotalix tubes, 3075 ; X-ray progress in Europe, 1372
Tyler, K. S., Modern Radio (B), 814
Tyne, G. F. J., early valves, 490, 2068

U

Ubbelohde, A. R., and I. Woodward, structure and thermal properties of crystals, 3256
Ulm, F. E., with others, photo behaviour of thallous sulphide, (A) 3634
Ullrich, E. H., signal amplitude discriminator, 1344
Urquhart, R. C., with others, h.v. electrostatic generator, (A) 3777
U.S. Army Ordnance Dept, Eniac calculator, 1828
U.S. Signal Corps, atmospherics locator, 1869

V

Valentine, C. E., with J. E. Reilly, voltage regulator, (A) 2814
Van Atta, L. C., beam-shaping in aerial design, (A) 1448
Vance, A. W. (W. A.), with others, Electron Optics and Electron Microscope (B), 1960, 2366
Vand, V., Prague conference on X-ray applications, 1968
Van de Graaff, R. J., with others, h.v. electrostatic generator, (A) 3777
Van Itterbeek. See van Itterbeek

Van Leeuwen, E. G., and W. F. Gunning, strain gauges, 2262
Van Valkenburg, H. E., ionization gauge, 2920
Varden, L. E., with J. Robins, photocell control for colour printing, 2[illegible]
Varley, G. C., with D. Lack, radar echoes from birds, 332
Vasko, A., infra-red radiation study, 3688
Vaughan, E. W., with others, model aircraft-aerial measurements, (A) 1448
Vaughan, J. T., and J. W. Williamson, induction-heating coils, 148, 2271
Veazie, E. A., 6AR6 beam tetrode, 3120
Vecchiacchi, F., u.h.f. radiotelephone links, 3750
Velasco, J., parallel-tube fidelity amplifier, (D) 2464
Venable, D., dielectric heating fundamentals, 1000
Vereshchagin, L. F., with B. M. Wul, permittivity of barium titanate, 1881
Vernon, W. H. J., corrosion causes, 807
Vertzner, V. N., electron microscope of U.S.S.R. State Optical Institute, (A) 1948, 3074
Vieth, L., beachmaster announcing equipment, 2802
Vilbig, F., and J. Zenneck, Fortschritte der Hochfrequenztechnik: Vol. 2 (B), 813
Villard, O. G., Jr, radar countermeasures, 2586 ; whistles from meteors, 916
Vinograd, J. R., with others, electron microscopy, 1950
Violet, F., and R. Lecuir, ceramics technique, 3327
Vissers, W., Jr, impedance measurement with c.r.o., 1578
Vladimir, L. O., low-impedance loop aerials, 3187
Vladimirski, V. V., e.m. wave propagation along single wire, 3008
Vlasoff, A. A., electron plasma theory, 1810, 3576
Vlasoff, A. G., electrostatic lens field calculation, (A) 1945, 3705 ; magnetic lens with minimum spherical aberration, (A) 1946, 3704
Vogt, K., with J. Grosskopf, polarized radiation, (A) 1330
Volf, C. A., public address system, 531, 1162, 1438
Volkenant, G., with D. G. Taylor, electronic aircraft control, 156
Voss, —., with —. Seulen, surface hardening of steel by induction heating, (A) 697
Vul (Wul), B. M., high-permittivity aerials, 3639 ; permittivity of seven titanates, 347
—— and I. M. Goldman, permittivity of barium titanate, 2935
—— and G. I. Skanavi, h.f. ceramic capacitors, 3779
—— and L. F. Vereshchagin, permittivity of barium titanate, 1881
Vvedenski (Wwedensky), B. A., u.s.w. refraction in troposphere, 403

W

Waddel, R. C., R. C. Drutowski, and W. N. Blatt, precipitation-static aircraft instrumentation, 1992
Waddell, J. H., wide-angle high-speed camera, 2354
Wagner, C. F., electronics in electric power industry, 991
Waidelich, D. L., a.f. power measurement, 1284 ; amplifier input impedance measurement, 970 ; high-resistance d.c. volt meter, 1590 ; steady-state operational calculus, 1276, (D) [illegible]
Wakefield, R. C., post-war communications, 2304
Wald, S., equivalent aerial circuit, 553
Waldmeier, W., solar corona problems, 77 ; sunspot numbers, for 1945, 2558, Oct./Dec. 1945, 1829, Jan./March 1946, 2559 ; sunspots, prediction of next maximum, 2560
Walerstein, I., with others, electrical properties of germanium alloys, 2216
Walker, J. H., h.f. alternators, 2347
Walker, P. H., with W. D. Richardson, B.B.C. mobile transmitters, 466
Walker, R. A., with others, effect of altitude on speech and hearing, (A) 3523
Walker, R. C., Electronic Equipment and Accessories (B), 707, 2281
—— with others, "Electrical Engineer" Reference Book (B), 1140
Wall, T. F., magnetron and klystron, 2082
Wallenstein, J., with others, triode for 600 Mc/s, (A) 1730
Waller, L. C., with D. A. Griffin, audio-modulated detection, 2694, 3035
Wallman, H., stagger-tuned wide-band amplifiers, (A) 1462
Walter, J. E., and W. D. Hershberger, microwave absorption in gases, (A) 3584
Walton, E. T. S., with M. G. Kelliher, spark-generated cm waves, 1101
Walz, F. C., with R. K. McCombs, pulse generator, (A) 1486
Wang, C. C., secondary-emission velocity-modulated valves, (A) 1400
Wang, M. H., with others, relative nature of electromagnetic radiation, 3252
Wang, P. Y., with A. C. Schwager, transmission-line diagrams, 548, (D) [illegible]187
Wang, T. J., with I. Paul, betatron pulsing system, 1211
Wanger, W., Brown Boveri h.v. laboratory, 3134
Warburton, F. W., reciprocal electric force, 1517
Ward, J. C., Jr, scientific research in war, 506
Ware, L. A., and H. B. Phillips, electron transit time, 1735
Ware, P. H., coaxial cable testing, 114
Warnecke, R., velocity modulated valves, 2392
Warner, A. J., jacketing for h.f. cables, 631, 2929 ; problems of u.h.f. cable manufacture, 845
Wartenberg, W. S., electrical measuring instrument for the blind, 1912
Washburn, H. W., with others, computer for simultaneous equations, 1927
Washburne, R., and A. Williams, future of amateur radio, 1134
Wassell, H. J. H., keying of r.f. transmitters, 480
Waterfall, F. E., with others, electrification of aircraft, 1993
Waterton, F. W., with J. M. Meek, h.v. vacuum electrometer, 374
Watkins, W. H., receiver servicing equipment, 3364
Watson, C. W., ground-controlled approach for aircraft, 622
Watson, D. S., skiatron in radar display, 2404
—— with others, radar displays, (A) 1857
Watson, J. H. L., applied electron microscopy, 1316 ; filmless sample mounting for electron microscope, 1621
Watson-Watt, R. A., radar in war and peace, 86
von Wattenwyl, A., with W. Amrein, c.r. time-interval measurement, 664
Watters, R. L., with A. H. Sharbaugh, 1.37-cm communication, 3051
Watts, C. B., Jr, with others, aircraft u.h.f. course indicator, 932
Watts, J. M., solar noise, 1824
—— with others, detection of rapidly moving ionospheric clouds, 3279
Wayne, T., aircraft equipment servicing, 2442
Weatherwax, R. C., and A. J. Stamm, electric resistivity of resin-treated wood, 1269
Webb, C. E., with R. S. J. Spilsbury, calibration of Grassot fluxmeters, 372
Webb, W., with R. C. Raymond, radiation resistance of loaded aerials, (A) 3183
Webb, W. L., with A. C. Omberg, aircraft position plotter, (A) 1528
Weber, E., metallized-glass r.f. attenuators, (A) 1576
Weber, H., insulation fault detection in cables, 427
Weber, M., electronic counters, 50
Weeks, J. R., capacitor life testing, 3778 ; polystyrene capacitors, 2343
Wehe, H. G., quartz crystal plating by evaporation, 941
Weighton, D., delay-line frequency modulator, 478
Weijers, T. J., frequency modulation, 3052, *vs* a.m. for broadcasting, 3730
Weill, A. D., with S. Field, Electroplating, A Survey of Modern Practice, including the Analysis of Solutions (B), 1275
Weiller, P. G., power-operated meter recorder, 1368
Weimer, P. K., with others, image orthicon, (A) 1704, 3085
Wein, S., Metallizing Non-Conductors (B), 2613
Weiss, W. L., nerve stimulator, 1609
Weisskopf, V. F., with E. Conwell, theory of impurity scattering in semiconductors, 2216
Weisz, P. B., G-M tube fire detector, 2987
—— and W. F. G. Swann, electron and mesotron ionization in cosmic rays, (A) 3631
Wells, G. M., with A. J. Biggs, quartz crystal activity measurement, 960, 2625
Wells, H. W., J. M. Watts and D. E. George, detection of rapidly moving ionospheric clouds, 3279
Wells, N., quadrant aerial, 1455
Welsh, R. R., with others, pulse altimeter, (A) 1528
Wente, E. C., and R. Biddulph, light-valve for film sound-recording, 8
—— C. A. Lovell and J. F. Muller, tone synthesis, (A) 3513
—— and others, stereophonic sound-film equipment, 5
Wentz, J. F., r.f. cable design, (A) 2130
Wert, C. A., with others, fire-control radar, 610, 1250, 1534
Werthmüller, A., with W. Gerber, electric heater hum, 1996
Wertli, A., effect of sleet on h.v. transmission, 3416
West, S. S., mine detectors, 1626
West, W., Reuters' wireless services, 3749
Westendorp, W. F., voltmeter for electron accelerator, 3672
—— and E. E. Charlton, 10^8-V electron accelerator, 438
Westinghouse Electric Corpn, industrial r.f. heating problems, 1307
Whaley, R. M., and K. Lark-Horovitz, effect of atmosphere on Ge rectifiers, (A) 3635
Wheeler, G. J., impedance conversion, 38
Wheeler, M. S., self-balancing phase inverters, analysis, 1195
Whinnery, J. R., with H. W. Jamieson, power amplifiers with disk-seal valves, 2855
Whitaker, J. N., capacitance r.f. switching, (A) 2070
White, A. B., electric strain gauges, 2990
White, B., broad-band regenerative receiver, 719 ; h.f. signal generator, 1605 ; receiver signal tracer, 2642
White, F. T., water and high polymers, 1560, 2936, 3641
White, J. E., microphone impedance analysis, 3532
White, J. G., contrast expansion, 304, 1792, (D) 1793
White, T. J., vertical rhombic aerials, 2144
White, W. C., bibliography of electronic applications, 2655 ; glossary of "trons", 1393 ; post-war valve business, 248
Whitehead, J. W., with A. J. Muir, c.r. tube for modulation at u.h.f., 3769
Whiteley, A. L., servo systems, theory, (A) 2013
Whitney, L. V., and A. D. Hasler, photoelectric fish counter, 1630
Widmer, A. E., corona voltmeter, (A) 2130
Widmer, V., with H. Fehlmann, induction furnace plant, 3375
Wiedenbeck, M. L., counters for nuclear spectroscopy, 1229
Wiener, F. M., with J. P. Egan, speech intelligibility and frequency distortion, (A) 3525
Wiggins, A. M., electromechanical analogy in acoustic design, 2447 ; unidirectional crystal microphone, 1434
—— with H. E. Ellithorn, noise in differential microphones, 1160
Wilbur, D. A., with others, split-anode magnetrons, 100-800 Mc/s, (A) 3479
Wilcox, D. E., with others, computer for simultaneous equations, 1927
Wilder, H. F., teleprinter regenerator, 2041
Wilder, M. P., extended-range television reception, 463, 1093
Wilhelm, H. T., wide range impedance bridge, 378
Wilkins, M. H. F., with G. F. J. Garlick, phosphorescence, 1806
—— with J. T. Randall, phosphorescence, 1808
Wilkinson, M., acoustics and flight of bats, (D) 521
Willard, G. W., air-seal test set for crystal units, 441 ; supersonic interference at angular reflection, (A) 1146
Willett, H. C., Descriptive Meteorology (B), 920
Willey, F. G., electrical solution of thermal problems, 3569
—— with D. W. Moore, Jr, radio telemetering, (A) 1613
Willey, R. E., infantry combat communications, 1997
Williams, A., with R. Washburne, future of amateur radio, 1134
Williams, A. C., Jr, acoustic intensity distribution from concave source, 820
Williams, A. J., Jr, and W. R. Clark, power-level recorder, (A) 1576
—— W. R. Clark and R. E. Tarpley, potentiometer recorder, 2249 ; recorder for flight testing and spectroscopy, (A) 1911
Williams, E. J., test of significance, 3492
Williams, E. M., r.f. spectrum analysers, 979
Williams, F. P., oscilloscope using mains as timebase, 2717
Williams, G., and H. C. Bolton, impedance concept applied to waveguides, 3178
Williams, G. A., temperature indicating compounds, 2596
Williams, H. J., domain patterns on Si-Fe crystals, (A) 3250
Williams, H. P., h.f. band-pass filters, 895, 896, 1498, 1804 ; m.k.s. units, 3493 ; vertical *vs* horizontal polarization for television, 2289
Williams, J. A., crystal-driven modulator for d.c. amplifiers, 557
Williams, M. R., 350-W vibrator power supply, 2352
Williams, R. C., and R. W. G. Wyckoff, metallic shadow-casting in microscopy, 1318
—— with others, electron microscope shadow-casting unit, 1007
Williams, R. C. G., radio servicing, (D) 2686
Williams, S. B., and R. E. Kern, stress measurement, (A) 1933
Williams, S. E., Knudsen absolute manometer, 2918
Williamson, J. W., with J. T. Vaughan, induction-heating coils, 148, 2271
Willis, E. S., filter for broad-band carrier systems, (A) 1787, 2165
Willoughby, E. O., field plotting, 2814
Willshaw, W. E., and E. C. S. Megaw, magnetron, 3113
—— with others, u.h.f. radio measurements, 1914, (A) 2963
Wilson, A. J. C., losses in Fe-Si alloy crystals, 1271
Wilson, J. N., with others, electron microscopy, 1950
Wilson, W., The Cathode-Ray Oscillograph in Industry (B), 3797
—— with L. Hartshorn, moisture meter, 388, (A) 933, 2653
Winchell, A. M., with A. R. Anderson, flexible wave guides, 3543
Windred, G., with others, "Electrical Engineer" Reference Book (B), 1140
Wing, A. H., with others, Transmission Lines, Antennas and Wave Guides (B), 555
Winget, D., tone control circuit, 26
Winlund, E. S., dielectric heating, basic factors, 3376, in furniture industry, 2272
Winn, O. H., with L. H. Lynn, marine radar for peacetime use, (A) 1847, In 2578
Winner, L., Broadcast Engineers conference, (A) 2143
Winter, D. F., fast sweep synchroscope, (A) 3770
Winter, L. L., and H. G. MacPherson, operation of graphite anodes, 1102
Winters, S. R., dielectric heating in food preservation, 2654 ; radar storm tracking, 1541 ; radio-controlled target aircraft, 1323
Wireless Engineer, Physical Society exhibition, 1133
Wireless World, aerials, elementary theory, 2521, 3544 ; army communication set No. 10, 470, 2706 ; British radio legislation, 1136 ; cathode follower, 41 ; communication receiver R.1155, 3029 ; component values for differentiating circuit, 2839 ; corner loudspeaker deflector baffles, 2461 ; d.c. restorer circuit, 900 ; Decca navigator, 1242 ; enemy broadcast monitoring, 197 ; exhibitions, Physical Society, 1288, Radio Component Manufacturers, 2047 ; frequency response with cathode bias, 874 ; l.f. tone correction, 2532 ; mine detector, 2666 ; multi-carrier communication systems, 1357, 2712 ; negative feedback, 1192, 1193, (A) 1790, and hum, 2514 ; proximity shell fuse, 89 ; pulse methods of navigation, 927 ; pulse modulation, 421, 1352, 2006 ; Pye television system, 459, 778 ; quality amplifiers, 281, 878, (C) 1200 ; radar fundamentals, 85, 328, (C) 1245, 1247, 1253 ; radio countermeasures, 1059 ; self-soldering for repair of field-telephone wires, 358 ; simple ohmmeter, 1291 ; super-regenerative receivers, 2690 ; telegraphy and radio, 618 ; wide-band amplifiers, 1190, 1789, 2508
Wisk, F., selsyn indicators for telemetering, 1068
Withers, R. M. J., with D. S. Perfect, photoelectric timing of moving body, 3861
Witten, E. A., naval radar, 614 ; pocket time-signal receivers, 1954
Witty, R., high-vacuum pumps, 356
Woernley, D. L., with L. G. Hector, permittivities of various gases, 1884
Wolff, I., and others, pulse altimeter, (A) 1528
—— with others, f.m. altimeter, (A) 1528 ; teleran aircraft navigation, 1546
Wonsowicz, J., and H. S. Brier, 135-500 Mc/s signal generator, [illegible]
Wood, F. W., with J. Bannon, cause and effect in F_2 layer, 1839
Wood, H., television v.f. stage, 3804
Wood, K. A., interrogator beacons, 1849
Wood, R. G., valve vectors, 53
Wooding, R. A., phase modulation, 1672
Woodman, E. H., electronics in waterway development, 137
Woodman, L. H., cathodic protection of buried metal structures, 93
Woods, E. C., atmospheric humidity nomogram, 3059
Woods, R. W., oscillatorless superheterodyne, 1660
Woodward, I., with A. R. Ubbelohde, structure and thermal properties of crystals, 3256
Wooldridge, D. E., signal and noise levels in magnetic tape recording, (A) 1754, 2804
Wooster, N., and W. A. Wooster, preparation of synthetic quartz, 3312
—— with W. A. Wooster, control of electrical twinning in quartz, 1874
Wooster, W. A., saw for cutting very hard materials, 2949
—— and N. Wooster, control of electrical twinning in quartz, 1874
—— with N. Wooster, preparation of synthetic quartz, 3312
Worthy, W. D., with H. Motz, calculation of magnetic field by relaxation, 658, (A) 1573
Wortman, L. A., tone control circuits, 3170
Wouk, V., timer circuits, 2832 ; vacuum leak tester, 1550
—— with W. M. Brubaker, vacuum leak tester, 1551
Wrathall, L. R., f.m. using nonlinear coils, 2381
Wreddon, J. H., with H. W. Chatfield, Varnished Cloths for Electrical Insulation (B), 3648
Wright, E. G., and S. Deutscher, electrostatic field mapping, 953
Wright, P. B., attenuating networks, theory and design, 60, 880
Wright, R. R., Electronics Laboratory Manual (B), 1742
Wrobel, H. T., and H. H. Chamberlain, testing of photocells, 2035
Wroe, H. N., attenuation equalizer design, 3560
Wulf, O. R., geomagnetism and atmospheric circulation, 596 ; solar radiation and geomagnetism, 1822
Wwedensky, B. A. See Vvedenski, B. A.
Wyant, R. A., contact resistance in spot welding, 1890
Wyart, J., action of water and KOH solution on silica, 2926
Wyckoff, R. W. G., electron microscopy, applications, 3383, frozen-drying for, 3387
—— with R. C. Williams, metallic shadow-casting in microscopy, 1318

Y

Yarwood, J., High Vacuum Technique (B), 654
Yates, H. G., wave analyser circuits, 2965
Yavorsky, B., ionization of hydrogen by impact, 2876
Yearian, H. J., d.c. characteristics of crystal rectifiers, (A) 3633
—— with others, d.c. characteristics of crystal rectifiers, (A) 3630
Yeh, C., focusing of cathode emission by grid-support wires, 3112
Yensen, T. D., hipersil as transformer iron, 952
Young, A. H., with S. Dushman, ionization gauge calibration, 1257
Young, E. H. P., sunspot cycle and propagation, 2284
Young, G. W., with E. J. Flynn, removing insulation from formex wire, 2930
Young, N. H., colour-television transmitter, (A) 1704
Young, V. J., Understanding Microwaves (B), 3156
—— with J. E. Browder, microwave transmission, power requirements, 482
Yu, Y. P., cathode follower coupling in d.c. amplifiers, 3557
Yudin, M. I., point location by three angle measurements, 2959
Yunker, E. A., with others, u.h.f. c.w. power generation, (A) 1715

Z

Zable, W. J., low-noise television receiver, 3407
Zahl, H. A., J. E. Gorham and G. F. Rouse, vacuum-contained triode transmitter, 1403
—— and J. W. Marchetti, early warning radar, 1249, 1535
Zarem, A. M., automatic memory oscillograph, (A) 2014, 2339
Zaret, M., with others, midget earphones, (A) 3534
Zavesky, R. J., with others, arcs for television lighting, 3094
Zavoiski, E., with others, paramagnetic absorption, 2543
von Zeerleder, A., spot welding of aluminium, 1889
Zeigler, A. W., sealed holder for crystal units, (A) 1700
Zeisz, B., with R. Schulze, contacts for Al and Mg conductors, [illegible]
Zel'dovich, Ya., and L. Landau, liquid and gaseous metals, 3589
Zelle, J., programme switching, 1725
Zeluff, V., aircraft radar, 2909 ; electronics, in aviation, 157, for inspection, 3702, in metal industry, 159, infra-red for night travel, 3708
—— and J. Markus, electricity and electronics developments, 513
—— with J. Markus, Electronics for Engineers (B), 1421
Zenneck, J., with F. Vilbig, Fortschritte der Hochfrequenztechnik: Vo. 2 (B), 813
Zepler, E. E., oscillation hysteresis in grid detectors, 2854
Zernov, D., secondary emission of dielectric films, (A) 2075
Ziegler, M., f.m. receiver, (A) 1654
van der Ziel, A., fluctuations in electrometer triode circuits, 2833
—— and M. J. O. Strutt, fluctuation suppression, 2844
—— with M. J. O. Strutt, fluctuation suppression, 2843 ; h.f. dielectric loss in glasses, 949 ; s/n ratio in triode amplifiers at v.h.f., 3740
Zimmermann (Zimmerman), K., design data and characteristics of h.f. cables, 2808
—— with E. A. Muller, v.h.f. transmission line test equipment, 982
Zollers, S. M., with others, vacuum gauge, 2203
Zwicker, C., signal tracer, 1920
Zwislocki-Moscicki, J., pulse-time modulation, (A) 3058
Zworykin, V. K., and L. E. Flory, reading aid for the blind, 2700
—— and others, Electron Optics and Electron Microscope (B), 1960, 2358

SUBJECT INDEX

SYMBOLS (A) Abstract, (B) Book Review, (C) Note of Correction, (D) Discussion

A

- **Absorption.** (See also Ionosphere; Sound; Spectrum; under specific gases)
  - acoustic, of material in room, 826
  - of light by plasma, 2542
  - medium-wave, ground, in India, 712
  - microwave, of ammonia, 2622, 3236, (C) 3237, (A) 3238
    - of gases, (A) 1336, 3234, (A) 3584, (A) 3585
    - of ground and water, 2673
    - of oxygen, 3396
    - of water vapour, (A) 3235, (A) 3719
  - paramagnetic, 2543
  - supersonic, in gases and liquids, 2794
- **Accidents.** See Safety
- **Acoustics.** (See also Absorption; Impedance; Radiators; Sound)
  - acoustic response curve tracer, 587
  - architectural, absorption of acoustic materials, 2117; measurement of reverberation, 3530; sound frequency distribution, 3528; studios, broadcasting, 2119, room surfaces, 2319
  - audibility in aircraft, 1428, 1429
  - electroacoustic transducer as transmitter, 265
  - electromechanical analogy in, 2447
  - equipment to combat high noise level, (A) 1150
  - and flight of bats, 258, (D) 521
  - intensity distribution from piston source, 820
  - sound-proof rooms for aircraft, 1428, 1429, for calibrations, 523, demountable, 825, 1753, 2118
  - sound rooms, anechoic, 3529
  - transmission through fluid lamina, 817
- **Adsorption**, studied by contact p.d., 3590
- **Aerial systems.** (See also Aerials cross references)
  - broadside, design, (A) 1446; optimum current distribution, 2487; 3-element, theory, 1774
  - directive, design, 36; for h.f., (A) 1448; small, 867; v.h.f., 1775
  - horizontal rhombic, radiation formula, 3188
  - rotating, remote control, 3191
  - symmetrical, 854
- **Aerials.** (See also Coupling; Electromagnetic theory; Lines; Radar apparatus; Television apparatus; Transmission lines; Wave propagation, electromagnetic)
  - aircraft, fixed and trailing, 34; measurements on models, (A) 1448; u.h.f., 35
  - analyser for, 286
  - artificial, two-terminal network as, 563
  - broadcasting, at Trivandrum, 552
  - cloverleaf, 2142
  - currents in, (B) 1182
  - cylindrical, current and impedance, 1453, (C) 3647; Hallén's equation, 851, (D) 2141
  - demonstration of properties, 285
  - design, beam-shaping in, (A) 1448
  - dipole, construction, (A) 1451
    - effective length, 1449
    - horizontal and vertical fields, 1769
    - polarization, 1330
    - remote tuned, 1181
    - unbalanced, field of, 2822
  - directive, 290
    - directional couplers, (A) 1448
    - umbrella, sloping-V, 2145
    - 28 Mc/s, 2827
  - dummy, for aircraft tests, 243
  - effective area and transmitted power, 2282, (D) 3122
  - and e.m. wave propagation, (B) 850
  - excitation of vibrators in, 2825
  - f.m., (A) 1448
  - gain measurements, 287
  - half-rhombic, 855
  - half-wave dipole and V-type reflector, polar diagram, (A) 891, (A) 3190
  - horizontal, quadrant, 1455
  - impedance measurement, 288, (A) 3664
  - loop, advantages, 2483
    - airloop, 289
    - coaxial-fed, 2481
    - for reception, design factors, 554
    - testing, 2484
  - magnetic, 3545
  - metal lens, (A) 1448, 2490
  - radar, (B) 555
  - radiation pattern calculation, 33
  - radiation resistance, and cable impedance, 1176
    - of loaded aerial, (A) 3183
  - receiving, coupling systems, 2835
    - iron-cored, 2485
    - low-impedance loop, 3186, 3187
    - noise in, 2699
  - rectilinear, polar diagrams, 1450
  - rhombic, efficiency, 3548
    - horizontal, radiation formula, 1456
    - and V, 2488
    - vertical, 2144
  - screened, intensity near cage, 3184
  - slotted cylinder, rocket, 3189
  - surveys, at Broadcast Engineers' conference, (A) 2143
  - theory, comparison, 1771
    - elementary, 2821, 3544
    - generalized reciprocity theorem, 1770
    - principal and complementary waves, 868
  - transmitting, short, efficiency, 1454
  - unsymmetrical, current distribution, 866
  - v.h.f., 1180, 1457, 2824
    - with parabolic reflector, 2788
    - slotted tubular, 2823
- **After-effect**, and related losses, [illegible]
- **Aircraft.** (See also Aerials; Blind landing; Control; Navigation; Precipitation static)
  - de-icer, timer for, 704
  - design, electronic aids, 398
  - h.v. characteristics, 2283
  - removal of static charges, 2437
  - speed measurement by radar, 397
  - target, radio-controlled, 1013, 1323, 1324, [illegible]
- —— **communication**, airport equipment, 1679
  - Marconi radio equipment, 238
  - receiver, wide range, [illegible]
  - survey, 604, 3425
  - transmitter, 1717, 3101
  - transmitter-receiver, wide range, [illegible]
- —— **electrical equipment.** (See also Transmitters)
  - a.c. generator, exciter, 3064
  - and atmospheric conditions, [illegible]
  - h.f. ignition system, 1019
  - isolation amplifiers, [illegible]
  - sound recording, 2803
  - survey, 1930
  - vibration control, 2434
- **Alarm system** for panoramic receivers, 3078
- **Alloys.** (See also Magnets)
  - aluminium, as conductors, 344
  - beryllium, uses, 3626
  - Fe-Si, crystals, losses in, 1271; hipersil, as transformer iron, 952
  - germanium, electrical properties, 2216
  - lead, for cable sheathing, 3647
  - light, in rectifiers, etc., 3768
  - metal, degassing, 392
  - triboelectric sorting, 3367
- **Alternating current** measurements, a.f. and r.f., (B) 3685
- **Alternators**, exciter-regulator, 3064; induction, 2347
- **Altimeters**, f.m., (A) 1528, 1863, pulse-type, 2567
- **Amateur radio.** (See also Transmitters)
  - 'break-in' system, 3050
  - f.m. for, 1049
  - frequency bands, 3747
  - future of, 1134
  - new F.C.C. rules, 2305
  - transmitter-receiver, 3405
  - transmitting licence, 1135, 2072
- **Ammeters**, aerial, remote indicating, 1290
  - d.c., multi-range milliammeter, 1586
- **Ammonia**, microwave absorption spectrum, 2622, 3236, (C) 3237, (A) 3238
- **Amplidyne** control system, 3765
- **Amplification**, divided-wave, 877, 1475
  - video, 3096
- **Amplifier circuits.** (See also Cathode followers)
  - coupling, pulse response, 892
  - eliminating distortion, 876
  - feedback, 10 c/s, (A) 1480
- **Amplifier-detector**, precision, portable, 2644
- **Amplifiers.** (See also Feedback; Signal/noise ratio; Television apparatus)
  - a.c./d.c. quality, 261
  - a.f., battery-operated, 279
    - expander-compressor, 2518
    - for f.m. monitoring, 1199
    - high fidelity, 1440, 2155, 2464, 2512, high-quality, 828, 878, (C) 1200
    - power, 722, 1166, using cathode follower, 3206
    - with re-entrant pentode, 3122
    - 60 W, 837
  - amateur transmitter, 481
  - balanced-output, 2154
  - biological, 45, 296, (D) 862, noise in, 44
  - booster, 3099, 3559
  - carrier-frequency, analysis, 66; transient response, 66, 1196, 1474, 3205
  - cascode, 2509
  - cathode biased, 566
  - cathode-coupled, 2507
  - class B, drivers for, 262
    - peak pulse currents in, 3563
  - d.c., 2511
    - contact-modulated, 2629
    - coupling, (A) 1185, cathode follower, 3557
    - crystal-driven modulator for, 557
  - design from pentode data, 2346
  - use of electrolytic tank, 1470
  - facsimile, compensating, 1712
  - feedback, (B) 583, (A) 1472, (A) 1496, 1788
    - design, (B) 2169
    - for galvanometers, 3670
    - and mains hum, 1477
    - stability, theory, 567
    - termination effects, 3556
  - gain-bandwidth product in, (C) 1468
  - gain formulae and measurements, 2841
  - gramophone, 2515
  - h.f., 144 Mc/s, 1495
  - hum elimination in, 1476
  - i.f., and a.f., circuit and construction, 1494
    - broad-band, design, 3223
    - capacitance-coupled, (A) 1462
    - stability factors, 2528
  - input impedance measurement, 879
  - intermodulation testing, 2043, 2641, 2978
  - isolating, for aircraft, 3738; cathode-coupled, 1197
  - l.f., for measuring thermocouple output, (A) 558
    - and null detector, 2634
    - for strain-recording signal reference, 1479
  - military, climate-resistant, 204
  - parallel valve, high-fidelity, 263
  - photocell for industrial control, 39
  - power, 1801
    - with diode load, 1478
    - with disk-seal valves, 2855
    - grounded-grid, 2065
    - neutralization, 577
  - pulse, for ionization chamber use, 1494
  - push-pull, with negative feedback, analysis, 3206
    - neutralized, 3464
    - phase-splitting, 861
    - reference chart, 295
  - reactive feedback, 2506
  - resistance-coupled, 59
  - r.f., class C, parasitic oscillations in, 1714
    - wide-band, design, 576, (A) 1461
    - 1 kW, 2753, 2771
  - three-channel, 2845
  - valve, noise factor, 1191, 1471, conditions for minimum, (A) 3558
    - ratio-controlled, (A) 1407
  - v.h.f., coil-neutralized, 393
  - video, tester, 2647
  - wide-band, 1190, 2506, stagger-tuned, (A) 1463, 1789
  - 28-Mc/s, suppressing parasitics, 2772
  - 200-kW, 6–22 Mc/s, 787
- **Analogies**, electromechanical, 293, 3152; in acoustic design, 2447
- **Angles**, transmission of, 2264
- **Anodes**, graphite, effect of surface finish and thickness on temperature, 1106
- **Antenna.** See Aerials
- **Antennalyser**, 286
- **Arc-duration timer**, 142
- **Atmosphere.** (See also Clouds; Fog; Meteorology; Scattering; Sound propagation; Wave propagation, electromagnetic)
  - irregularities, and e.m. wave propagation, 1049
  - stratosphere, constituents of, 3278
  - troposphere, thermal structure, 1838
  - turbulence, (A) 2563
  - wind velocity in upper air, using u.s.w. d.f., [illegible]
- **Atmospheric electricity**, eclipse effect, 2561
  - solar effect, 1822
  - theory, 2186
- **Atmospherics**, storm locator, 1869
- **Attenuation.** (See also Absorption; Cables; Scattering; and individual subjects)
  - anomalous, in waveguides, 3549
  - method of curve plotting, [illegible]
- **Attenuators**, bridged T and H, 2498
  - r.f., metallized-glass, (A) 1576
- **Audiometers**, 839, early type, 1442
- **Aurora** and geomagnetism, (A) 1236
  - spectrum, 2904
- **Automatic control.** (See also Servomechanisms)
  - instruments for, 1891; mechanisms, 1574; nonlinear systems, theory, (A) 3331; vehicular traffic, 131
- **Aviation**, electronics in, 155, 157, 158, 1628
  - radio, (B) 1256

B

- **Bats**, acoustic control of flight, 258, (D) 521
- **Batteries**, dry, 1696
  - Ruben-Mallory mercury, 1695
  - 6-V charger, 2350
- **Beacons.** See Navigation aids; Radio beacons
- **Beam tetrodes**, characteristics, 2091
  - secondary emission, 3119
  - theory, 3118
  - 6AR6, 3120
- **Beta rays**, two-dimensional focusing by magnetic field, 2873
- **Betatrons**, beam removal, 3438, 3439
  - historical development, 1068
  - pulsing system, 1211
  - 10^8-volt, 438, 767, 1370
- **Bimetal**, tapered-thickness, for thermostats, 757, (D) 2281
- **Biological applications.** (See also Amplifiers; Heating, radio-frequency)
  - amplifier for, 44, 45, 296, (D) 862; blood analysis with photoelectric colorimeter, 967; diathermy, 1619; double-beam c.r. tube, 3072; electroencephalographs, 1566; electrotherapy, (B) 1021; medical probe, 138; nerve stimulator, 1609; piezoelectric unit for physiological recording, 2985
- **Bismuth**, thermal conductivity at low temperatures, 2174
- **Blind**, electrical measuring instruments for, 1918; obstacle locator for, 1309, 1620; reading aid for, 3709
- **Blind landing system**, microwave, 622, 2915, 3297, Sperry, 1255, 1584, 2588
  - portable, 1865
- **Bolometers**, a.c., for infra-red spectroscopy, 984
  - nickel, 1556
- **Boundary problems**, e.m. diffraction, 2548
  - reflectivity of optical coatings, 313
  - tangential, impedance representation, 3255
- **Brazing** in transmitter valve assembly, 651
- **Breakdown.** (See also Dielectrics)
  - in air, at u.h.f., (A) 3573
  - field-strength lowering, in waveguide air-gaps, 3320
  - high voltage, in vacuum, (A) 3575
  - of solid dielectrics, 948
  - testing, of rubber-insulated wire, 3668
- **Bridge circuits**, nonlinear, 976, for voltage stabilizers, 867, 2494
- **Bridges**, a.c., null indicator for, 123, 672
  - Schering, improving sensitivity, 3676
- **Broadcasting.** (See also Aerial systems; Communication systems)
  - as cultural medium, 3504
  - duties of engineer, 2102
  - history of first U.S.A. broadcast, 745
  - multiplex, 3049
  - post-war, in U.S.A., 2009
  - problems in Canada, 1355
  - programme switching, 1725
  - u.h.f. in India, 746
    - proposals, 424
- —— **stations**, alarm system, 3441
  - CBC short-wave, 193, 744
    - control room design, 2316
  - directory, U.S., 2708
  - frequency measurement, 2246, 2975
  - maintenance, 2319, 2709, 3055, 3423
  - monitors, 2319
  - studio equipment, 3422
  - two-studio console, 2317
  - 2UE, 240
- —— **systems**, French, stereophonic, 1064
  - transmission lines and switchgear, 2139, (A) 3180
- **Busbars**, coaxial, inductance, 2815

C

- **Cables.** (See also Impedance)
  - balanced, measurement at 10–200 Mc/s, 667
  - buried, heat losses, 1508
  - coaxial, attenuation measurement, by S-function method, 666, (D) 2242, at u.h.f., 1597
    - polyethylene spacers for, 28
    - solid-dielectric, flexible, 1766
    - test measurements at low r.f., 114
  - fault location, 427, 428, 429, 2336, 3345; splice detector, 140, 387
  - h.f., design data and characteristics, 2860
    - jacketing material, 631, 2929
  - history of technology, 543
  - ignition, high-altitude testing, 207
  - insulation for, survey, 2604
  - low voltage, 341
  - measurements on h.f., (A) 1913, l.f. and d.c., 3346
  - multiconductor, heating, 1767
  - power, current rating, 2811
  - propagation velocity measurement in, 2977
  - r.f., power rating, 3066
    - solid-dielectric, 1765
    - symposium, (A) 2130
  - screened twin, capacitance and thermal conductance, (A) 861
  - sheathing, alloy solution, 2947
    - lead alloy for, 3647
  - submarine, earth currents in, 2895
  - twin, capacity calculation, 669, 1446
  - with twisted conductor groups, theory, 1172
  - u.h.f., solid-dielectric, manufacturing problems, 345
  - underground, corrosion, 510, 511
  - v.h.f., developments in, 1764
- **Calculations and calculating machines.** (See also Charts; Graph paper; Mathematical instruments; Slide rules)
  - for a.c. networks, 47
  - computer for simultaneous equations, 1987
  - differential analyser, 261, (C) 2234
  - electronic, [illegible]
  - Eniac calculator, 1923, [illegible]
  - for Fourier series, 2957
  - integrating machine, 1904
- **Calculus, operational.** (See also Transients)
  - application to transmission lines, 550
  - for discontinuous functions, 962
  - Heaviside's circuit theory, (B) 2636
  - steady state, 1276, (D) 3329
  - survey, [illegible]
- **Cameras.** (See also Television apparatus)
  - continuous recording, for oscilloscope, 761
  - high-speed, wide-angle for studying apparatus action, 2954
  - shutter tester, 1922
- **Capacitance measurement**, 3666
  - i.f. bridge, 676
  - for small capacitors, 670
    - production testing, 124
    - with tetrode electrometer, 2626
- **Capacitors**, construction, German, 3792
  - electrolytic, (B) 453

glass sealed, 212
h.f., ceramics in, 3779
life testing, 3778
use of light metals in, 3768
for measurement, characteristics, (A) 1919
polystyrene, 2343
silvered mica, manufacture, 755
Carrier-current systems, (B) 3192
comparison of various modulation types, 190
for control, 3043
diversity, (A) 1668
equipment, 1046
f.m., stabilization, 2765, 3104
history, 732
with h.v. lines, 3417, effect of sleet, 3416
power cables for, 189
3-channel, Swedish, 3044
Cathode followers, 41
analysis, (A) 565, 875
circuits, chart, 1469
coupling in d.c. amplifiers, 3557
internal impedance, 42
u.h.f. dangers, 1189
Cathode-ray oscillographs, double-beam, 3072
high-speed, for transient measurements, 2024
high voltage, (A) 1080
memory, (A) 2014, 2339
microwave, (A) 1576
three-beam, 1692
quadruple-beam, 2338, 3772
synchroscope, (A) 3770
of wide laboratory application, 3677
—— **oscillography.** (See also Television ; Timebases ; Transients)
high-speed photography, 1693
in industry, (B) 3797
introduction, (B) 2355
measuring small powers, 2637
pulse duration measurement, 3663
recording of infra-red spectra, 3373, 3374
visible speech, 3520
—— **oscilloscope**, for impedance measurement, 1578
using mains for timebase, 2717
midget, 211
using the 913 tube, 1079
—— **tubes.** (See also Electron beams ; Electron motion)
deflexion system, (A) 1111
electron gun, 3124
high-voltage, 5RP, 3123
image formation, (D) 3483
ion burn, 2403, 3824
with metal-backed screens, (A) 1730, 2402
for modulation measurement at u.h.f., 3769
seasoning timer, 1698
selection and power supply, 775
television, distortion measurement, 3683
uniformity control in production, 251
writing, 1705
Cathode rays, burns from, 1129
Cathodes, complex, photoelectric, (A) 1819
heaters, insulation protection, 2396
oxide. (See also Electron emission ; Photocathodes)
pulse emission of, 244
saturation current and contact potential, 3810, measurement, 2779
secondary emission from, 3107, temperature dependence, 3467, 3468
X-ray study, 3811
space-charge-limited, total emission damping, 3109
Cathodo-luminescence, growth and decay, 3240
Cavitron, particle accelerator, 2037
Cavity resonators. (See also Magnetrons)
circuits with lighthouse valves, 1483
coaxial, TE modes in, 888, tunable, 1482
design data, 2847
e.m. field in, 3265
frequency stability of, 3208, 3209, 3210
measurements in, 2240
oscillations in, theory, 3211
thermodynamic treatment, 2521
tuning by electron beams, (A) 3825
Ceramics, dielectric properties, (A) 3318
in h.f. capacitors, 3779
metallizing, 2945
properties, applications and manufacture, survey, 3326
structure, investigation, 1951
technique of preparation, 3327
Charged particles. See under Particles
Charts, alignment, (B) 663, 3491
atmospheric humidity, 3059
beat-frequency interference, 1990
capacity and inductance, 2829
cathode follower circuits, 1469
decibel conversion, 1281
driving push-pull amplifiers, 295
filters, low-pass, 52, (C) 869, RC, 561
f.m. and ph.m., 2312
frequency nomogram for LC circuit, 1204
impedance, 1183, 2477
inductance of straight wires, 2146
link-coupled coil design, 3199
mixer frequency, 3737
nomograph construction, 2830, 3332
perveance, 2774
phase-shifter, 2151
power loss, 294
range prediction, 736, 737
resistance loss, 1184, 2492
series-parallel equivalent circuits, 1783
tanh and coth $(\alpha + j\beta)$, 549
television waveform, 2359
temperature in heating and cooling, 3241
transmission line, 548, (D) 2137
valve, 2086
Chemistry, electron diffraction, etc., in, (B) 1633
Chokes, h.f., design, 435
iron core, optimum air-gap, 763, (D) 2340
u.h.f. characteristics, 1369
Chronoscope, for explosion velocity, 2261
Cinematography with electron microscope, 1009
Circle diagrams, for impedance measurement, 3549
for resonant microwave systems, (A) 3555
Circuit analysis, i.f. amplifier design, 3223
nonlinear, 1492, (A) 1986, calculation of intermodulation products, 2163
push-pull, cathode-coupled output stage, 879
—— **theory.** (See also Calculus, operational ; Matrix theory ; Networks ; Nonlinear problems ; Transients)
applications of Thévenin's theorem, 37
elementary, (B) 68, 902
Heaviside's theory, (B) 2535
network analysis and amplifier design, (B) 583
Nyquist diagram, 2842, generalization, (A) 2300
resonant circuit and negative-resistance element, 3214
Circuits. (See also Bridge circuits ; Counter technique ; Filters ; Networks)
amplifier. See Amplifier circuits
a.v.c. design chart, 897
balancing loads, 3197
betatron pulsing, 1211
blocking effects using floating grid, 1214
butterfly, asymmetrical, 1208, coaxial, 883, (A) 1209, 1797
clamping, 2530
for computational work, 3365
coupled, 305, theory, 2501
current stabilizer, analysis, 48
differentiating, component values, 2839
double-tuned, design and theory, 2152
gate, for chronographs, 2148
LC, for 140–450 Mc/s, 1484
limiting, 1802
nonlinear, empirical laws, 3195, graphical analysis, 556
oscillator, u.h.f., 3215
permeability-tuned, tracking, 3224
printed, 1887, 2229
pulse-integrating, (A) 1459
restorer, uses, 67, 782, 900
series-parallel equivalence, chart, 1783
tapped inductor, 3561
timing, 2159
tone control. See Tone control
trigger blocking oscillator for, 62
tuned, band-spread, design, 1803, (A) 2856
cascades, transient response, 3204
transmission-line, 63
u.h.f. and s.h.f., 2520
u.h.f. oscillator stability test, 973
valve. See Valve circuits
Clouds, height detector, 1943, 2657
Coastal refraction, experimental investigation, 161, theory, 2672
Coaxial cable. See Cables, coaxial
—— **lines.** See Transmission lines, coaxial
Code translator, 2730, 3792
Coils, for constant magnetic gradients, 1082
design, (B) 218, for v.h.f., 66, 2732
for induction heating, 148, (D) 2271
with iron-dust cores, losses, 3435, precautions, 3201
link-coupled, design, 3199
multilayer, eddy-current resistance, 764
nonlinear for f.m., 2381
standard-Q, h.f. properties and applications, 3774
testing, simplified, 366
toroidal, self-inductance calculation, 765, (D) 2341, winding machine, 2721
universal, winding, 773, 1085, 1701
Cold working, effect on structure of metals, 955
Colour television. See Television, colour
Communication. (See also Aircraft communication ; Broadcasting ; Circuits ; Light-beam communication ; Mobile communication ; Receivers ; Reception ; Transmission ; Transceivers ; Transmitter-receivers)
electrical, survey, 181
German, 3151, research, yearbook, (B) 747
long-distance, evolution of technique, 1048
naval wartime problems, 2098
range of radar sets, 3607
—— **engineering**, developments, Brown Boveri, 3413, 3745, 3746, Post Office, 730, 1102, (A) 2773
—— **equipment**, British army set No. 10, 470, 2706
telephone 1.37-cm, 3051
transmitting, receiving and hailing set, 1386
U.S. Army, 182, 1997
—— **systems.** (See also Broadcasting ; Carrier-current systems ; Relay systems)
airborne, teletype, 1354
'break-in' operation, 3050
f.m., description, 2313, v.h.f., 191, 402
multichannel, 183, 416, (A) 3742
multiplex, 3049
narrow band, (A) 1998
proposed post-war, 2304
Reuters' news, 3749
selective calling, 2731
selective pulse, 2309
ship-to-shore, 1670
telephone, microwave, in Paris, 3743
two-way, (B) 1680
u.h.f., radiotelephone, Italian, 3750
v.h.f., multi-carrier, 1357, 1669, 2326, (A) 3424
Western Union beam telegraphy, 3048, 3748
Compass, aircraft, flux valve, 603
Components, microwave, electroforming technique, 1563
Computation, circuit design for, 3365
Condensers. See Capacitors
Conductance measurement, r.f. bridge, 676
Conductivity, h.f., NaCl solution, 2549
Conductors, aluminium alloys, 344
cylindrical, resistance and capacitance relations, 766, (D) 2342
L and C measurement, 3346
Conferences, conventions and exhibitions, ASLIB, 496 ; British Scientific Instruments, in Sweden, 3071, 3832 ; Broadcasting Engineers, 2125, 2143, 2319, 2365, 2701 ; B.T-H., electronics, 3378, 3500 ; cosmic rays, 321 ; Cosmic Terrestrial Research Lab., 1331 ; F.B.I., 3131 ; Ferranti on radar, 929 ; frequency allocation in Europe, 2702 ; German electronic equipment, 1940, 2438 ; Inst. of Phys. and Instn Chem. Engrs, 1691 ; Instrument Technology, 3499 ; Inter-American Radio, Rio, 1123 ; I.R.E., receiver design, (A) 1978 ; I.R.E.–U.R.S.I., (A) 3494 ; N.P.L., 3137 ; Paris Fair, 1945, 2440 ; Physical Society, 1131, 1132, 1133, 1288, 1289, (C) 1606 ; Prague, X-ray applications, 1953 ; Radio Aids to Marine Navigation, 3291 ; Radio Component Manufacturers' Federation, 2047 ; R.A.E., electronics, 398 ; Roy. Inst. Chem. & Inst. Phys., Faraday Soc., dielectrics, 3317 ; Roy. Met. Soc. and Phys. Soc. on radio meteorology, 3013 ; Royal Society Scientific Conference, 3828 ; Science and Radio, 3140 ; Society of Motion Picture Engineers, 3087 ; Strasbourg, magnetism, 3597 ; Television Society, 3093 ; various electronic, 2048
Constants, physical, card index, 933
Contact potential in adsorption study, 3590
measurement, 1282
metal and semiconductor, (C) 2179
Contacts, for Al and Mg conductors, 945
carbon to copper, friction-reducing film, 340
electrical, noise due to, 3263
electrical springs, (D) 3061
sliding, physics of, 1219
Contrast expansion, 304
using negative feedback, 1792, (D) 1793
for sound films, 9, 10
Control. (See also Amplidyne ; Electronic devices ; Photoelectric cell applications ; Telecontrol ; Telemetry)
automatic. See Automatic control
carrier-current system for, 3043
circuits, frequency selective, (A) 1480
contouring, of machine tools, 1625
crystal, f.m., 479 ; h.f., 472, 144 Mc/s, 3807 ; 450 Mc/s, 1926
electrical, amplidyne, 3765 ; fish fence, 1631
electronic, of aircraft, 156 ; machine tools, 2259 ; *vs* other methods, 3690 ; resistance welding, 2258
using floating grid, 1214
frequency. See Frequency control
industrial, (B) 1958 ; electronic, 389
production, with 2 MV X rays, 1622
quality, (B) 2110, 2424 ; classification of defects, 2423 ; use of electronic devices, 3702 ; for engineers, (B) 3597 ; of insulating varnishes, 1883 ; in manufacture of insulators, 255, (D) 2428 ; methods of sample testing, 2421 ; sequential analysis, (B) 2444 ; statistical methods in, 503, 804, 805, 1411, 1412, 2422, (D) 2425, (D) 2426
radio, of V2 rockets, 1322
relay circuits, 1321
remote, relay system for, 1368 ; transmitter, 2353
step, photoelectric, 3495
Converters. (See also Frequency converters)
power, rotary, 3767, vibratory, 3431
Cores, ferromagnetic, in a.c. fields, 2809
powdered iron, characteristics, 3434
losses in, 3435
permeability of, 644, 646, 1081
proposed testing standard, 1286
in receiving aerials, 2485
transformer, temperature distribution in, 202
Corona discharge, and mobility of negative ions, (A) 1814, 3578
solar. See Solar corona
Corrosion, atmospheric and immersed, causes, 807
cathodic protection, (C) 2433
electrolytic, measurements, 808
non-ferrous, causes and remedies, 806
packaging protection, 590, 2104
protection. See Sealing ; Tropicalization
resistance of Sn–Zn alloys, 2599
of steel, by sea air, 3830
in tropics, 256, 809
of underground cables, 510, 511, metal, 93
Cosmic noise, r.f., 3270, (A) 3598, 3599, interstellar origin, 3271
—— **radiation**, asymmetry and absorption, 3274
and orbits near magnetic dipole, 322
and rotating magnetized body, 75
—— **rays.** (See also Betatrons ; Cyclotrons ; Mesons)
conference, (A) 321
electron and mesotron ionization, (A) 3601
existence of highly ionizing particles, 1816
geophysical aspect (Guthrie lecture), 593
intensity at solar eruption, 3276
lunar effect, 3272
origin, 2181
radiosonde techniques for, 2986
soft component, equilibrium spectrum, 74, at high altitudes, 73
solar and sidereal, diurnal variation, 3273
and sunspot activity, 2887
survey, (B) 79
Counter applications, fire detector, 2987 ; gunfire rate, 1015 ; nuclear research, 1229, 3759
—— **technique**, circuits for signalling system, (A) 1779
decade circuits, (A) 1581, 2497, 3776
high counting rates, (A) 1460
statistical treatment, 3336
Counters, directly-coupled pentode, 2496
electron and nuclear, (B) 3081
electronic, 50, 2147
Geiger-Müller for *in vivo* study, 3760
self-quenched, organic vapours for, (A) 3762
particle, high-speed, (A) 3761
triode, (A) 1361
proportional, ionization measurement in, (A) 3665
Coupling. (See also Amplifier circuits ; Amplifiers)
aerial to line, 2825, transformer design, 856
Crack detection. See Flaw detection
Crystal oscillators. See Oscillators, piezoelectric
Crystals. (See also Piezoelectricity ; Quartz)
duplex, resonance, 2967
elastic constants, 2213
forced vibrations in, (A) 2156
relative position in rectification series, (A) 3628
Si–Fe, and domain theory, (A) 3250
structure and thermal properties, 3256
X-ray study of surfaces, 2611
Current indication, incandescent, 1577
measurement, with mercury manometer, 975
Cyclotrons. (See also Cosmic rays ; Electron acceleration ; Particle acceleration ; Synchrotrons)
acceleration of charged particles in, 2885
theory, (B) 2357

D

Deafness. (See also Hearing aids)
measurement of, 2116
Decca navigator, 331, 607, 1242, 1848, 2192, 3606
Decibel notation in radio and acoustics, (B) 1141
Delay network, design, 1785
Department of Scientific and Industrial Research, work, 491
Design, engineering developments in 1945, 2096
Detection, of objects. See Mine detectors ; Radar
audio-modulated, 2694, 3035
Detectors, application of feedback, 1663
bridge, phase sensitive, 2635
crystal, germanium, 1728
h.f. rectification efficiency, (A) 3636
noise in, (A) 3725
silicon, 771
diode, low distortion, 1988, (D) 1989
f.m., (A) 721, ratio, 574, without limiter, 891
grid, oscillation hysteresis, 2854
high-level, 2682
superregenerative, 1032, 2691, selectivity, 1662
Diamond tools, (B) 1894
Dielectric constant measurement, by Drude's 2nd method, 2623
moisture content determination, 992
—— **loss.** (See also After-effect)
of hexane, ether and vaseline oil, 1882
—— **heating.** See Heating, dielectric
—— **materials.** See Insulating materials and cross references
—— **properties.** (See also Insulating materials and cross references)
barium titanate, (A) 3625, at high pressures, 1881, variation with field, 2835
of dipolar solids, 3304
of electrolytes, 2883
of liquid and gaseous metals, 3589
measurement at u.h.f., 966, (A) 1915
of metal-ammonia solutions, 3588
of polythene at v.h.f., 2937
of titanates, 3319
of various gases, 1884, at h.v., (A) 3777
—— **strength.** See Breakdown
Dielectrics. (See also Insulating materials and cross references)
breakdown strength, 2605
dipole liquids in strong field, theory, 2540
high permittivity, 633
interfacial polarization, temperature coefficient, (A) [illegible]
Lectronol, 636, (D) 2220
in theory and application, symposium, 3317
thermal conductivity, 1818
water films on, in high humidity, 2933
Differential equations, of harmonic oscillator, [illegible]
second order, approximate integration, 3334
solution of, 1570, with planimeters, 2814
stability of systems, 2954
Diffraction. (See also Electromagnetic theory)
of elastic waves, 1906
microwave, at circular aperture, (A) 3717
of radio waves round the earth, 160
theory, 319
Diffusion pumps. See Pumps, diffusion
Diodes. (See also Detectors ; Resnatrons)
input resistance, calculations, (D) 1023
shot effect, [illegible]
theory, (A) 3826
Dipoles. See under Aerials
Direction finders. (See also Radio beacons)
automatic, (D) 2814
f.m., for aircraft detection, (A) 1254
loop, mutual perturbation, 3284
Radioguide, 1545, [illegible]
shielded U Adcock, (A) 1881
for storm location, (A) 3293
visual indication, (A) 1528
—— **finding.** (See also Aerial systems)
aperiodic sense indicator, 2575
calibrating transmitters, 337
device for transmission of angles, 2264
night errors, in aircraft, [illegible]
Discharge. (See also Corona)

gaseous. (See also Electrons; Gas discharge)
small perturbations, **1224**
in t.r. switches, (A) **3819**
at u.h.f., (A) **3574**
and voltage stabilizers, (A) **3758**
—— **lamps**, electric, (B) **3082**
—— **tubes.** See Cathode-ray tubes; Switches, t.r.; Thyratrons
Discriminator, amplitude, **1844**
Distortion, a.f., cross modulation, **1644**; measurement, **117**, **2253** **2641**
B.S.I. definitions criticism, **1338**
effect on speech amplitude, (A) **3524**, frequency, (A) **3525**
by nonlinear resistances, **2153**
Documentation, microfilm, **2409**
Doppler effect of light in refracting medium, **314**
Drawing aids for relay profiling, **1067**
Dynamotors, tester, **2639**
Dynatron, measurement applications, **968**

E

Earth, electric field, and geomagnetism, anomalies, **2185**; magnitude of charge, **2184**
—— **currents**, in submarine cables, **2895**
Earthing, and earth current, **29**
Eddy currents in metal sheets, **353**
resistance of multilayer coils, **764**
Elasticity, strain. See After-effect
Electrets, **950**
Electrical apparatus, cooling of, **514**
survey of development, **3495**
—— **engineering**, basic, (B) **2445**
—— **equipment**, naval, adaptation to war conditions, **650**
—— **properties** of salt water at r.f., **1880**
—— **safety.** See Safety
Electricity, principles, (B) **3596**
Electroforming, **1563**
Electrolytes. (See also Salt solution)
dielectric properties, **2883**
Electrolytic tank, in amplifier design, **1470**
Electromagnetic field, e.m. modes between parallel planes, **1516**
initial boundary problems, **1515**
Laplace solution by relaxation methods, **658**, **1573**
plotting methods, **2814**
problems, **2545**, solution by overlapping regions, **1571**
—— **theory.** (See also Diffraction; Equivalent circuits; Mathematics)
Biot-Savart law and Newton's laws, **70**
conducting medium with magnetic afteraction, **2544**
definition of magnetic field strength, **2879**
dielectric ellipsoid in field, (C) **907**
diffraction problems, **2548**
generalized aerial reciprocity theorem, **1770**
and gravitation theory, **71**, **2172**, **2881**
heat conduction and inductance in elliptical cylinder, **3570**
Liénard-Wiechart formulae, **2619**
potential theory, integral equations, **1572**
reciprocal electric force, **1517**
relative nature of e.m. radiation, **3252**
saddle-point method, **1024**
wave equation, near periodicity of solutions, **1901**, **1902**, **2615**
in non-uniform medium, (A) **1329**
—— **waves.** See Waves, electromagnetic
Electromagnets, a.c., for nonmagnetic substances, (A) **2430**
Electromechanical analogies. See Analogies
Electrometers, high-voltage vacuum, **374**
Electron acceleration, application of microwaves, (A) **3788**
—— **accelerators.** (See also Betatrons; Cyclotrons; Particle accelerators; Synchrotrons)
and e.m. modes, (A) **1516**
linear, cavity for, (A) **2277**
radiation losses, **2039**
synchro-betatron, **3786**
voltmeter for, **3672**
—— **beams**, dynamics of, **362**
in oscillating field, energy interchange, **1394**
in strong magnetic fields, **1112**
—— **current** in multielectrode valves, theory, **1109**
—— **diffraction**, cameras, improvement of resolution, **1314**
high dispersion, by primary magnification, **1005**
—— **emission**, field, (A) **1952**, velocity distribution, **1104**
grid, **1598**
impulse, of oxide cathodes, **244**, (A) **2076**
measurement, using pulses, (A) **797**
from metals, survey, **3581**
secondary, of dielectric films, (A) **2075**; of metallic oxides, (A) **2390**; from oxide-coated cathodes, **3107**, temperature dependence, **3467**, **3468**; of pyrex glass, (C) **1392**; of solid bodies, (A) **2074**; from thin metal films, **939**
thermionic, anomalous current, **1513**
—— **flow**, in conductors, **587**
—— **lenses.** (See also Magnetic lenses)
computation, **1315**
electrostatic, analysis, **1003**; effect of space-charge, (A) **1313**; field calculation, (A) **1945**, **3705**; measured characteristics, (DC) **1944**; optical properties, **2998**
magnetic, (A) **1946**
to reduce spherical aberration, **3382**
satisfying Newton's image relation, **1004**
—— **microscopes.** (See also Proton microscopes)
electron-optical aspects, (B) **2669**
electrostatic, theory and design, **3706**
field-emission, (A) **1952**
filmless sample-mounting, **1621**
introduction, (B) **3715**
lens distortion, **3381**
microtome for, **1319**
objectives, defects, (A) **3385**
and proton microscope, **3384**
RCA, beam current stability, (D) **1012**
resolving power, **1010**, **1011**, **1947**, variation with voltage, **3245**
shadow-casting unit, **1007**, **1949**
of U.S.S.R. State Optical Institute, (A) **1948**, **3074**
—— **microscopy**, (B) **1960**, (B) **2358**,
bibliography, **1006**, (A) **1317**
cinematography in, **1009**
correcting lens, **3362**
frozen-drying for, **3387**
replica techniques for surface study, **1008**
shadow-casting application, **1318**
specimens for, preparation, **395**, **1950**, stability, **3386**
stereoscopic, **1316**
structure of ceramics, **1951**
survey of applications, **3383**
—— **motion.** (See also Electron accelerators and cross references)
force between two electrons, **913**, **2547**, **3253**
in h.f. fields, application of theory, **1398**, (C) **2777**
physical limitations of devices, **1395**
transit time in varying fields, **1735**
—— **multiplier**, photoelectric, (A) **2028**
—— **optics** and electron microscope, (B) **1960**, (B) **2358**, **3384**
magnetic lenses, investigation, **2276**
Petzval field curvature, **2998**
Electron plasma. See Plasma
Electronic applications. (See also Biological applications; Control; Mine detectors; Telemetry); **152**, (B) **1828**, (B) **2281**, **3693**, bibliography, **2655**; A.A. gunfire control, (A) **1528**; arc-furnace regulator, **894**; aviation, **155**, **157**, **158**; in chemistry, (B) **1633**; engine pressure-time recorder, **1624**; in engineering, **2273**; exhibits, Phys. Soc., **1132**, R.A.F., **398**; furnace temperature control, **144**; in industry, **3690**, **3699**, electric power, **891**, metal, **159**, U.S., **213**; machine tool control, **1014**; multicolour printing, **3697**; naval problems, **494**, (A) **1613**, **2278**; petroleum refining, **2996**; scientific measurement, **3351**; waterway development, **137**
—— **devices.** (Cross references as above)
American developments, **2073**; comparator gauge, **2991**; economics of, **1619**; energy conversion in, (AD) **2394**; fire detector, G-M tube, **2967**; fuel gauge, **1017**, **1018**, **1611**; German, **2438**, **3150**; glossary of 'trons', **1393**; high-speed photography of explosions, **2439**; recorder for flight testing and spectroscopy, (A) **1911**; survey, **2263**; various, B.T-H., **3378**
Electronics, **72**; electrochemical processes in, (A) **647**; in engineering, (B) **1421**, **1942**, bibliographical index, (B) **2106**, (B) **3156**, U.S. directory, **2610**; equipment and accessories, (B) **707**; in industry, (B) **3001**; introduction, (B) **253**; survey of development, **1941**
Electrons. (See also Particles)
capture, after discharge, (A) **3818**
free, in static magnetic and electric fields, **3242**
point, classical theory, **1509**, **2175**
scattering of light by, **2537**
size, and mass, **906**
Electroplating, (B) **1275**
Ni on steel by chemical reduction, **3324**
purification of Rh plating baths, **3323**
Sn-Zn, **2941**, corrosion protection, **2599**
Electrostatics, field, plotting. (See also Electrolytic tank; Field, electrostatic)
static electrification, **908**
Emission. See Electron emission; Ion emission
Emissivity, infra-red, of metals at high temperatures, **2869**
Engineering. (See also Instruction and training)
'Electrical Engineer' reference book, (B) **1140**
electromagnetic, (B) **1139**
methods and production costs, **1413**
scientific method in, **1408**
Engineers, electrical, British, in war, **415**, **729**, **921**; selection of staff, **3505**
Equalizers, attenuation, design, **3560**
three-band variable, **1170**
Equivalent circuits, for heat problems, **2429**, **3569**
of spherical vibrator, **3160**
valve, **53**, **249**, **864**, **1187**
for various systems, **1898**
for waveguide structures, (A) **1448**
E.R.A., annual report, (A) **2414**
Evaporation of metals, technique, **940**
Exhibitions. See Conferences, conventions and exhibitions
Eye, comparison with photocells, **2361**

F

Facsimile amplitude modulator, (A) **1390**
equipment for use in aircraft, **3444**
four-colour process, **2737**
to moving train, **3088**
synchronizers, **1709**
systems, Cable & Wireless, **2058**, Faximile and Telefax, **2389**
Faders, automatic, for broadcast programmes, **65**
various systems, **60**
Fading. (See also Communication; Field strength; Wave propagation)
short-wave, **2290**
Feedback, application to detectors, **1663**
negative, in amplifiers, principles, **1192**, (A) **1790**
applying, charts, **40**
effect on load and distortion, **1193**
and mains hum, **1477**, **2514**
voltage, **43**
Ferromagnetic materials. See Alloys
Ferromagnetism. (See also Cores; Permeability)
critical temperatures for spontaneity, **2882**
expression for ferro-inductance, **643**, (D) **2223**
magnetic testing, **3644**
properties of Ni-Cr-Fe heater-wire alloys, **1996**
theory, **2178**
Fiberglas, acoustic properties, **1156**, **1430**
Field, electric. (See also Earth)
negative ions in, **3578**
wave mechanics representation, **903**
electrostatic, calculation for electrostatic lens, **3705**
between coaxial cylinders, **317**
investigation by valve voltmeter, **3572**
plotting, **953**, **3322**
—— **strength.** (See also Wave propagation)
intensity bursts and ionospheric reflection, **1333**
measurements, in metre-wave band, **1028**, (A) **1334**, (D) **1335**, beyond horizon, (A) **1636**
remote-indicating meter, **2250**
on ship stations on 500 kc/s, **2071**
at v.h.f., **2631**
range data long-range forecasting, **1635**, range calculator, **737**, u.s.w. non-optical paths, (A) **1028**
Films. (See also Sound film)
insulating, (D) **352**, (D) **641**
metallic, Al, density, **2211**, electrical resistance, **2212**, optical properties, **2209**, **2210**
evaporation technique, **940**
nickel, preparation, **1556**, resistivity, **343**
on non-conductors, (B) **2613**
optical, **1555**
photoelectric effect, (A) **1504**
secondary emission from, **939**
thin, Ni, resistivity, **3306**; waveguide applications, **1795**
motion picture, use in television programmes, (A) **2365**, **3800**
non-conducting, thickness meter, **2260**
scientific, requirements and value, **3829**
thin, Bi, resistance-temperature coefficient, **1878**
deposition on glass, **3306**
and friction, (A) **2173**
MgF_2, anti-reflection, **2598**
refractive index, **2598**
and surfaces, (B) **2860**
tungsten oxide, for spark gaps, **1888**
Filters. (See also Networks)
band-pass, h.f., **885**, **886**, **1498**, **1804**
two-crystal, **3238**
bridged-T, **1466**
circuits, using back-coupled amplifier, **563**
crossover for dual loudspeakers, **1458**
crystal, **51**, **2164**
for broad-band carrier systems, (A) **1787**, **2165**
piezoelectric crystals for, **3196**
T-section, (A) **1896**
wide band, **579**
design, preferred numbers, **299**, **2502**, **2503**
double-derived terminations, **872**
effect of coil Q, **56**
graphical symbols suggested, **2094**
l.f., using coils and capacitors, **3201**
low-pass, design, abacs, **58**, (C) **869**, tables, **871**
log line, **1497**
rejection, tunable, (A) **1787**, **2604**
resistance-capacitance, chart, **561**
theory, (B) **584**, and design, (B) **1806**; using matrices, **1467**
transient response, **870**, **1188**
transmission line, **2480**
types and applications, survey, **873**
Flaw detection, electronic, **134**
supersonic, **822**, **1148**, **1149**, **1424**
Fluctuation, in electrometer triode circuits, **2833**
spontaneous, statistical theory, **3411**
suppression in amplifiers and receivers, **2843**, **2844**
voltage, in semiconductors, **2603**
Fluorescence. (See also Luminescence; Phosphorescence; Screens)
of solutions, **2592**
Fluorescent lamps. See Illumination
Fluxmeters, calibration, **372**
direct-reading, **1287**
Grassot, **2969**
Fog, measurement of droplets, **2431**
Fourier analysis, illustration, **368**
for pulse forms, **116**
survey and applications, **3651**
Frequency. (See also Ultra-high frequency)
allocation, (A) **1668**
amateur bands, **3747**
European, conference, **2702**
F.C.C., **2001**
f.m., **733**
control, automatic, in receivers, **2684**, for r.f. heating, **1936**
for f.m., **2384**, **2385**, **2765**, **3104**, **3105**
conversion, superheterodyne, in receivers, **2692**, by phase reversal, **1985**
converters, crystal-controlled, 2 m, **2296**
f.m., for WHFM, **2382**
long wave, **175**
and mixers, multigrid, **3408**
recent developments, (A) **1406**
triode, conversion diagrams, **408**
28 Mc/s, **1661**, **1967**; 50 Mc/s, **2693**; 112 Mc/s, **419**; microwave, (A) **1649**
discriminator, (A) **1491**, linear, **3731**
dividers, circuit for, **308**, (A) **886**, (A) **887**
and timebase converters, (A) **896**, (D) **2093**, **3826**
division and synchronization, **3214**
doubler, from mains, **2351**
drift, causes, **1645**
measurement, broadcasting stations, **2246**, **2975**
patent, **369**
survey of development, **2245**
u.h.f., **679**, **1295**, (A) **1923**, **3678**, **3679**
meters, heterodyne, **2252**, **2974**, construction, **3355**
l.f., **2976**
as master oscillators, **3099**
u.h.f., **1594**
modulation. See Modulation, frequency
multiplication, **2067**, for v.h.f., **793**
response with cathode bias, **874**
stability, of cavity resonators, **3208**, **3209**, **3210**
stabilization, microwave, (A) **1576**
of resonators, **1107**
of 144 Mc/s transmitter, **2062**
at 450 Mc/s, **1926**
standards. (See also Standard frequency)
and applications, **2973**
generator, quartz, **3354**, **3363**
suggested new unit, using logarithmic scale, **965**
Fresnel reflection formulae, (A) **1807**
Friction, and boundary films, (A) **2173**
of instrument bearing, **3669**
mechanism of, **1219**
Fungus. See Humidity
Fuse, proximity, **89**, **623**, **624**, **625**, **626**, **1627**, **2279**, **2667**, design, **3713**, history, (A) **1326**, valves for, (A) **1398**

G

Galvanometers, amplifying system, **373**
negative-feedback amplifiers for, **3670**
and oscillographs, (B) **689**
time-constant reduction, **2630**
Gas discharge, h.f., (A) **1726**, probe method of study, **1872**
oscillations, (A) **3266**, effect of magnetic field, (A) **3267**
positive column, **1512**
theory, **1510**
tubes, **1729**
Gauges. See Ionization gauges; Vacuum technique
Generators, electrostatic, h.v., (A) **3777**
single-sideband, **889**
Geomagnetic activity, 1941/45, **1835**, 1945, **1836**, July-Sept. 1945, **2565**, Jan./March 1946, **2554**
—— **field**, harmonic analysis, 1945, **1837**
—— **storms.** (See also Solar activity)
in India, Jan.–March 1946, **2568**
survey, **2567**
28th March, 1946, **2569**, **2570**
Geomagnetism. (See also Earth, electric field; Ionosphere)
and atmospheric circulation, **596**
atmospheric solar effect, **1822**
and aurora, (A) **1236**
field beneath ships, **3602**
induction effects, theory, **1834**
secular variation, (A) **1237**, and surveys, **2564**
solar-diurnal period, **2894**
and solar radiation, **2557**
theory, **2896**
work of Carnegie Institution, **592**
Geophysics. See Prospecting
German equipment, capacitors, **2723**; communication systems, **3151**; electronic, **1949**, **2438**, **3150**; industrial techniques, **2987**; infra-red, **2860**; midget receivers, **2294**; Post Office research, (B) **747**; radio and radar, (A) **1528**; u.h.f. receivers, **1648**, valves, **1399**
Germanium, photo-effects in, (A) **3314**
Glass, anti-reflection films for, **2598**
fibrous. See Fiberglas
h.f. dielectric loss, **949**
for miniature valves, (A) **1565**
pyrex, secondary emission, (C) **1392**
sintered, **1991**
technology, (B) **2232**
for tropical use, **2846**
Gramophone amplifier, **2615**
needles, tests, **625**
radio, Swansonette, **3028**
recording. See Pickups
records, error in high band measurements, **524**
position spotter, **1428**
remote record selection, **2664**
reproduction, playback loss, **1**
Graph paper, logarithmic, use of, **3654**
Gravitation and e.m. theory, **71**, **2172**, **2881**

H

Hardening. See Heating; Surface
Harmonic analysis. See Fourier analysis; Waveform analysis
—— **synthesizer**, **1917**, **2244**
Headphones, high-fidelity, **15**
insert, (A) **3534**
Hearing. (See also Audiometer; Deafness)
auditory perception at different intensities, **2797**
persistence, and interaural masking, **1567**
—— **aids**, earphone for, **2460**
frequency characteristics, (A) **3533**
and pocket radio, **1763**
specifications for performance measurement, **276**
testing, **1441**

Heat conduction, equivalent circuits, **2429**
to surrounding medium, **1507**
problems, electrical solution of, **3569**
Heating, dielectric, applications, in bakeries, **1939**, blanching vegetables, **393**, food preservation, **2654**, furniture industry, **2272** ; basic factors, **3376** ; chart, (C) **999** ; coupling methods, **2498** ; economics and applications, **696** ; fundamentals, **1000** ; optimum frequency, **150** ; of plastics, **151** ; for rubber, **1617, 1618, 3695** ; survey, **149**, (B) **1959, 3377**
induction, applications, soldering, **1616**, surface hardening of steel, **697**, valve manufacture, **1615**, wood joints, **3694** ; coil design, **148**, (D) **2271** ; crucible failure, **695** ; furnace, (A) **997, 998**, coreless, (A) **1937**, plant, **3375** ; heater capacitors, **636**, (D) **2220** ; of hollow cylinders, **1614** ; for local heating, **1938** ; long cylindrical charges, (A) **1933, 2993** ; moving magnetic strip, **147** ; oscillators for, (A) **1613** ; oven form factor, **2270**
of multiconductor cables, **1767**
radio-frequency, use of a.f.c., **1936** ; applications, **1935**, dehydration of penicillin, **1308**, hardening of plastics, **3696**, for moulding plastics. **394** ; automatic rematching in, (A) **1934** ; of conductors and nonconductors, **146** ; design of equipment, **2994** ; in engineering, **2269** ; in industry, **391, 1307** ; for processing, **145**, (A) **996** ; and radiant heating, (D) **2268** ; survey, **2992**
Heavy water, infra-red spectrum, (A) **3239**
High altitudes, effect on electrical apparatus, **515** ; testing of ignition cables, **207**
High fidelity. (See also Amplifiers ; Tone control)
in moving-coil pickups, **833**, (C) **1762** ; survey, **528**
High-frequency measurement, wavemeter, 155 – 255 Mc/s, **3680**
technique, (B) **813**
High voltage. (See also Corona)
d.c. power supply, **1684**
engineering, survey, **3497**
generator for lightning to aircraft investigation, **2344**
laboratory, Brown Boveri, **3134**, N.P.L., (A) **2415, 3138**
networks, superposed h.f. carriers, (B) **3192**
Horizon, graphical determination, **400**
Horns, electromagnetic, calculation of field, **2468**
generalized plane wave theory, **828**
new family, **829**
Hum, and negative feedback, **1477, 2514**
Humidity. (See also Atmosphere ; Tropicalization)
atmospheric, nomogram for. **3059**
and fungus, effect on insulation, **1561**, plastics, **1562**
and moulds on radio equipment, **3502**
recorder, for control, **3371**
relative, of gases, recording, **3372**
resistance in amplifier design, **204**
Hydrogen, ionization by impact, **2876**

I

Illumination, fluorescent lamps, survey, **517**
Image converter, infra-red, **2346, 3471, 3688**
Impedance. (See also Aerials ; Charts ; Circle diagrams ; Transmission lines)
characteristic in optics and acoustics, **3262**
concept applied to waveguides, **3178**
driving-point, of solid plate, **2114**
matching, conditions for series and shunt sections, **1178**
conjugate image method, **1784**
in dielectric heating, **2498**
graphical solutions and charts, **865, 2837**
in r.f. circuits, **3200**
by transmission lines, **2820**
measurement, aerial, (A) **3684**
amplifier input, **970**
with c.r.o., **1578**
with dynatron, **968**
feeder calculation, **3549**
r.f. bridge, **676**, (A) **1592**, measurement with 10^9 to 1 range, **378**
using valve source, **122**
v.h.f., **677, 977, 1916**
of multiple-winding transformers, **1685, 2017**
negative, stabilized, **54**
in parallel, calculation, **2828**
representation for tangential boundary conditions, **3255**
series and parallel components, **1203**, conversion graphs, **38**
Inductance of coaxial busbars, **2815**
mutual, measurement, **3666**
of straight wires, nomogram, **2146**
Induction heating. See Heating, induction
Industry. (See also Control ; Electronic applications and devices ; Electronics ; Research)
electric and electronic, survey, **513** ; radio, in Europe, **3153**, German techniques, **2927** ; and research, **3131** ; war work of S.T.C., **3135**
Infra-red. (See also Spectrum)
absorption of phosphors, **3301**
applications, German military equipment, **2860** ; night travel, **3706** ; rifle sight, **2346, 2861** ; thermal detectors, **3687**
radiation study, image converter, **3471, 3688**
spectroscopy, bolometer for, **984**
high-speed c.r. recording, **3373, 3374**
[illegible] switching, **1667**
Instruction and training, a.c. demonstration devices, **3148** ; electricity and magnetism textbook, (B) **2886** ; engineering, **507**, and administration, **1126**, electrical, in wartime, **3486**, post-graduate, (D) **2435**, U.S. colleges, **1124** ; instrument technology, **3489** ; in radio industry, (D) **1128** ; and technical, **1127**, part-time, **1125**
Instruments. (See also under Aircraft)
electrical, heat dissipation, **1415**
Phys. Soc. Exhibition, **1289**, (C) **1606**
measuring. (See also Ammeters ; Fluxmeters ; Galvanometers ; Ohmmeters ; Voltmeters ; Wattmeters)
bearing friction, **3669**
for the blind, **1912**
construction, LCR or Q meter, **2848**
electrical, **1285**, survey, **3351**
electronic volt-ohmmeter, **375**
increasing magnetic field in, **752**
jewels and pivots, (A) **3428**
microfarad, **978**
rectifier, errors, **3350**
scientific, (B) **2257**
British, Swedish exhibition, **3071, 3832**
Insulating materials. (See also Dielectrics ; Glass ; Mica ; Plastics ; Polyethylene ; Polymers ; Polythene ; Rubber ; Silicone ; Varnishes ; Wood)
ASTM standards, (B) **1274**, (B) **1985**
barium titanates, **3639**
corrosion in tropics, **256**
effect of humidity and fungus, **1561**
film-forming, (D) **641**
plastics *vs* ceramics, **632**
for radio, survey. **2694**
sulphur hexafluoride, (A) **3777**
varnished cloths, (B) **3648**
Insulation. (See also Breakdown ; Insulating materials)
jacketing materials for h.f. cables, **631**
resistance, measurement, **3667**
test equipment, h.v., **678**
Insulators, bushings, field mapping for, **953**
covered cable, [illegible], **28**
[illegible], **255**, (D) **2423**
Interference, adjacent channel, **3713**
beat-frequency, chart, **1990**
with broadcast, due to amateur transmitters, **3739**
in f.m. reception, **172, 1994, 1995**, multipath, **1941** ; suppression, **2291**
heterodyne, reduction, **726**
hum, due to electric heaters, **1996**, mains, elimination, **1476**
impulsive, measurement, **2248**
from industrial apparatus, (AD) **2700**
motor-car ignition, **3741**
from power supply, in telephone systems, **3046**
precipitation static, **3038**, reduction, **2322**
tabular analysis, **2695**
in television, **3097**, local-oscillator, **2303**, multipath, **793**
Interferometer, supersonic, for 4 Mc/s region, **1749**
Intermodulation products, calculation, **2163**, (A) **2851**
in valves with nonlinear characteristics, **2852**
testing of a.f. amplifiers, **2641, 2978**
sound films, **271**
triodes and beam power valves, **2043**
Ion burn. See Cathode-ray tubes
—— **emission,** from thoriated tungsten, (A) **3466**
—— **motion,** in strong electric field, **3578**
—— **sources,** h.f. discharge as, **3261**
Ionization by collision, energy loss, **2177**
of gases, h.f. conduction-dispersion, **3246**
hydrogen, by impact, **2876**
neutral centres, **586**
by meteors, **1520**
—— **chambers,** pulse amplifiers for, **1404**
—— **gauges.** (See also Vacuum technique)
calibration for various gases, **1257**
circuit, (A) **629**
with electronic control, **2920**
radium source, (A) **3617**
Ionosphere. (See also Absorption ; Scattering ; Solar radiation Wave propagation, e.m., ionospheric)
absorption and reflection coefficient, **3014**
theory, **2287, 3007**
critical frequencies, annual variations at Tromsö, **2571**
diffusion in, **598**
E layer, sporadic E scatter, **1840**
storm effects in, **2899**
equipment, measuring, **2983**
panoramic, **3279**
recording, Kerr cell modulator, **2049**
F_2 layer, cause and effect in, **1839**
ionization and magnetic dip, **2898**
and geomagnetic effects, on currents, **2897**
on reflection, **1026**
geophysics of, survey, **3280**
low-level reflections, at Christmas Is., **1841**
and intensity bursts, **1333**
predictions, methods, **3721**
short-term, solar and geomagnetic data for, **2553**
simple account, **1964**
survey of position, **2285**
rapidly moving ionospheric clouds, **3889, 3279**
refractive index. **2901**
short-period fluctuation of echoes, **1968**
and solar activity, measure of, **3281**
and solar corona, **77**
and solar eclipse, **1832, 2562, 2892, 2893**
of 10th Sept. 1942, **2187**
of 9th July 1945, at Tromsö, **599**
and s.w. broadcasting, **3395**
Iron. See Coils ; Cores ; Ferromagnetism ; Magnetism ; Magnetization
Isoscope, 445

J

Jamming, enemy. See Radar countermeasures
Japanese equipment, magnetrons, **2399**

K

Kenotrons, cold-emission, (A) **2387**
Keying, frequency-shift, **2306, 2764**
morse, automatic, **2042**
of transmitters, **480, 2067**
Klystrons. (See also Modulation, velocity ; Oscillators ; Ultra-high-frequency generation ; Valves, velocity-modulated)
cascade amplifier, (A) **1730**
construction and principles of operation, **2081, 2082, 2391, 3474**
reflex, theory, **1734**, (C) **2080**, (A) **2393, 2776**
water jet analogue, **3473**

L

Laboratories, Brown Boveri h.v., **3134** ; for electronics, furnishing, **1416** ; Interservice Radio Propagation Lab., **1963** ; M.I.T., electronics research, **2416** ; National Physical, high-voltage research, **3138**
Lamps for power measurement, **2638**
Lenses, metal-plate, **2490**
moulded Lucite, **1095**
Librarianship, science, **3488**
Libraries, radio reference, **2408** ; research, need for. **2407**
Light. (See also Reflection ; Scattering)
change of frequency, and path variation, **3231**
reflection from corner, **3568**
scattering by water drops, **1506**
transmission by water drops, **1505**
unmodulated, photocell detection, **1088**
velocity, (B) **560**, (B) **915**
Light-beam communication, developments, (A) **1686**
Lightning to aircraft, h.v. generator for study, **2344**
ball, **1238**
—— **protection** for transmission lines, **2335**, h.t., **760**, (D) **2334**
Limiters, use of diode, **1862**
effect of two f.m. waves in, **3399**
Lines, overhead, tension in, **2808**
transmission. See Transmission lines
Lissajous figures, harmonograph for, **824**
Literature, scientific, organization, **3136** ; selections of historical interest, (B) **3109**
technical, glossary of f.m. terms, **2311** ; presentation, **497, 1120**, I.R.E., **1121**
Location, radio-acoustic ranging, **335**
of undersea craft, **1241**
Loss, energy, due to after-effect phenomena, **2828**
between source and sink, chart, **2492**
Loudspeakers. (See also Public address systems)
corner deflector baffles, **2461**
directional, reducing feedback, **17**
distortion reduction, **529, 1436**
duplex, **16**
high-quality, small, **830**
marine, **3536**
military, **532, 1439**
modulated air, **533**
moving-coil, causes of [illegible], **268**
multiple, set-up, **269**
output stage, **3727**
permanent magnet, for public address, **2124**
testing, quarter-wave method, **267**
for theatres, **1163**, two-way, **530**
woofer-tweeter, crossover network, **529**, two-horn, design, **1437**
Luminescence. (See also Cathode-ray tubes ; Cathodo-luminescence ; Fluorescence ; Phosphorescence)
effect of wavelength, **2922, 2923**
of uranium glass, **2207**
Luminescent materials, characteristics, (D) **104**, (D) **640**, and preparation, **1871**

M

Magnesium fluoride, evaporation of thin films, **2596**
Magnetic field. (See also After-effect)
with constant transverse and longitudinal gradient, **1062**
magnetomotive force gauge, **1563**
measurement by fluxball test coil, **974**
use of multiple circuits, **752**
parametric oscillations in, **2546, 2880**
perpendicular, superposition, nonlinear phenomena, **2378**
uniform, coils for, **2720**
—— **lenses,** spherical aberration of, **3704**
—— **materials.** (See also Alloys ; Ferromagnetism ; Permeability)
general survey, **642** ; review of improvements, **1270**
—— **resonance,** nuclear, **1514**
—— **susceptibility,** measurement, **3684**
—— **wire.** (See also Sound recording, wire)
B-H curve tracer for, **2247**
Magnetism. (See also Cores ; Geomagnetism ; Permeability)
application to material testing, **3692**
coercive field theory, **3249**
demagnetizing factor for ellipsoids, **3251**
domain theory, and magneto-resistance, (A) **3248**, and Si-Fe crystals, (A) **3250**
energy equations, **1227**
paramagnetic absorption, **2543**
proceedings of 1939 Strasbourg conference, (B) **3597**
theory, development, **642**
unit magnetic poles, (A) **3247**
Magnetization, curves, potentiometer for determination, **3349**
and stress, **2224**
Magnetometers, Oersted-meter for weak fields, **2968**
Magnetophon recording, 2463
Magnetostriction, in Ni, effect of transverse field, **3254**
Magnetrons. (See also Oscillators ; Ultra-high-frequency generation)
cathodes, (A) **1730**
cavity, **1401, 2400, 2781, 2782** ; development, (A) **2084, 3812** ; theory and uses, **1403** ; tunable, **2398**, (A) **3480**
cylindrical, space charge in, **3478**
general description, **3113**
Japanese, **2399**
locking in phase, (A) **3788**
microwave, **800**, (A) **1730**
mode of operation, **2082**
plane, space charge in, **3477**
rising sun, **3114**
split-anode, 100–800 Mc/s, (A) **3479**
technique, recent developments, **2780**
tuning by electron beams, (A) **3825**
Magnets, permanent, alloys for, **103**
magnetization, by capacitor discharge, **2719, 3773**
materials and design, **2607**
steels for, **951**
study by magnetic potentiometer, **2939**
testing, **951**
Maintenance. See Broadcasting stations ; Servicing
Manometers, bellows, **3427**
Knudsen, **2918**
Massspectrographs. See Spectrographs
Materials. (See also Dielectric properties ; Insulating materials ; Magnetic materials)
development in 1945, **1558**
substitutes and synthetics, encyclopaedia, (B) **2231**
Mathematical instruments. (See also Calculations and calculating machines ; Slide rules)
photoelectric Fourier transformer, **656** ; planimeter for solution of differential equations, **2614**
—— **tables,** arc sin X, (B) **1575** ; circular, hyperbolic, factorial and probability, (B) **2620** ; cylinder functions, **709** ; functions, with formulae and curves, (B) **2237** ; index, (B) **3339**, (B) **3660** ; Legendre functions, (B) **1279** ; survey, **3653** ; 6-figure trigonometrical tables, (B) **113**
Mathematics. (See also Boundary problems ; Calculus, operational ; Computation ; Differential equations ; Fourier analysis ; Matrix theory ; Nonlinear problems ; Probability ; Quantum mechanics ; Relaxation methods ; Statistics)
books, for radio engineers, **112, 662, 2936, 3337, 3338**, calculus, **3659**, u.h.f., **1280**
curve fitting, **3328**
equations, Hallén's for cylindrical aerials, **851** ; Laplace, **360** ; Mathieu's, computation, **1277**
Forchheimer's problem, **1508**
functions, Bessel, of imaginary argument, **1900**, series expansion for, **2836** ; Fourier transforms. **568** ; Laguerre, in e.m. theory of paraboloidal reflectors, **1969** ; Stokes, **3330** ; theory of, (B) **1278**
heat conduction, **1507**
integrals, Schuster's, **1899** ; $\sin^2x\,dx/x$, (A) **3331**
point location by three angle measurements, **2959**
Matrix theory, of networks, **55, 1467**
Measurement. (See also under individual subjects)
a.c., (B) **2284**
applications of radio to, **2650**
capacitors for, (A) **1919**
in cavity resonators, **2240**
electrical, of mechanical quantities, (B) **706**
electronic, of physical properties, **2963**
of L and C for conductors and cables, **3346**
remote indication, **3343**
Measuring instruments. See Instruments, measuring ; Meters
Megaphones, electric: acoustic feedback in, **17** ; microphones for, **1758**
Mercury arcs, electron liberation, **1815**
Mesons, intensity variation with altitude, **2877**
production by electrons, (A) **3582**, in stratosphere, **[illegible]**
Metals. (See also Alloys ; Films, metallic ; Surface : individual metals)
liquid and gaseous states, **3580**
structural changes on cold working, **865**
Meteorology, books, [illegible], **1524**, [illegible]
of lower stratosphere, **3278**
observational methods, **2968**
and radio, conference, **3013**
weather forecasting and E layer, **601** ; and electrical engineering, **605**
Meteors, ionization due to, **1520**, whistles from, **916**
Meters. (See also Ammeters ; Frequency meters ; Galvanometers ; Instruments, measuring ; Noise meters ; Ohmmeters ; Voltmeters ; Wattmeters)
electronic overload protection, **1584**
panel, production testing, **1585**
Mica, electrical grading, **[illegible]**
glass-bonded, manufacture, **1267, 2219**
Indian, properties, **[illegible]**
physical properties, **[illegible]**, and electrical, **1558**
synthetic, German, **348**
Microfilm. (See also Documentation)
survey, **3506**
Micrometers, capacitive, **3368** ; electrical, **384** ; electronic, **2991, 3686**
Microphones, crystal, mounting, **14** ; output meter, **1169** ; for sound ; pressure [illegible], **2459** ; [illegible], **1434**
differential, antinoise characteristics, **1169**

for electric megaphones, 1786
electronic, (A) 1435
gradient, unidirectional, 827
impedance analysis, 3165, 3532
moving-coil, (A) 1161
pressure-operated, 2120
survey, 2458, 2801, 3166
theory and response curves, 1755
throat, (A) 1754, 2121, 2122, (A) 3533
Microtome for electron microscope, 1319
Microwaves. (See also Switches, t.r.; Ultra-high-frequency; Wave propagation, e.m., ultra-short, and cross references)
scattering at sea surface, (A) 3718
systems, resonant circle diagram, (A) 3555
Mine detectors, (A) 619, 700, 1325, 1626, 2666, 3390; applications, 3711; survey, 3712
Mixers for crystal microphones, 1169
crystal, noise spectrum, (A) 1649
frequency charts, 3737
nonlinear, calculation of output, 1492, (A) 1986
potentiometer for, 7
triode, conversion diagrams, 408
for 112 Mc/s converter, 410
Mobile communication. (See also Transmitter-receivers; Transmitters)
army, microwave relay, (A) 1666
B.B.C. war reporting, 466
bicycle receiver, 716
boat radio installations, 795
fire and police, 1678, multicarrier, 1857, 2326, 2712, transmitters, 3453
f.m. telephony for cars, 2324
f.m. transmitter for police, 2750
metre-wave receiver, 3732
naval warfare, (A) 1666
radioteletype 2–18 Mc/s, 2007
for relay broadcasting, 3414
train, American, 1062, 1063, 1358, 2325, 2710, 2711, 3088, 3389
Modulation. (See also Intermodulation)
amplitude, depth meter, 2979, 3682
and phase, physical basis, 3461
carrier-wave, 190, (A) 1439
frequency. (See also Broadcasting; Receivers; Reception; Transmission; Transmitter-receivers; Transmitters); (D) 1051, 1675, 3062
for amateurs, 1049
vs amplitude, 1050, for broadcasting, 3730
applications to physical measurements, (A) 3347
B.B.C. field trials, 3751
circuits, 1050
for cm-wave propagation, 402, 1971
common-channel interference, 1995
communication systems, 2313
conversion from a.m., phasitron for, 1405, 2092, at u.h.f., (A) 3025
from ph.m., 2767
valves for, (A) 1730
crystal control, 479, (A) 1666, 2768, 2769, transmitter, 477
definition of terms, 2311
effect of multipath propagation, 1041, 2321
exciter, 2380
frequency control, 2384, 2385, 2765, 3104
gramophone pickup circuit, 2853
i.f. transformers for, 2831
interference in, 1994
mutual effect of two f.m. waves, 3399
network response, 1463
using nonlinear coils, 2381
and phase, 1347, (A) 1666, nomograms, 2312
s/n ratio and distortion, 3420
spectrum, 2704
survey, 734, 1671, 1673, 2703, 3418, 3419
theoretical principles, 2310
transmitters using phase modulation, 2766
varying concepts, 502, 1674
grid, class C, 2379, 2763
for portable transmitter, 2762
peak chopped, 1724
phase, 1672
pulse. (See also Relay systems); 183, 739, 742, 1092, 1676, 1677, (D) 2707, (D) 3054, (D) 3752
advantages, 2006
for amateur communication, 2314
amplitude discriminator, 1344
British No. 10 set, 470, 2706
circuits, and spectrum, 1800
equipment, 3421
multiple transmission, 740, 741
noise determination, 2307
nomenclature, 1053, 1351
principles, 421, 1352, (A) 3053
technique, 1350
time selection, 2309
suppressed carrier, (A) 1548
velocity. (See also Klystrons; Valves, velocity-modulated)
principle, 2381
Modulators, amplitude, for facsimile, (A) 1390
high-fidelity, 475
class B, in broadcast transmitters, 3766
input and efficiency, 310
transformer design, 3221
crystal-driven, for d.c. amplifiers, 557
frequency, (A) 1349, 2383
delay-line, 478
pulse, 64
thyratron, 2770
reactance tube, 2068
Moisture meter, 388, 992, (A) 993, 2653
Monitoring of enemy broadcasts, 197, 1359
Moon, radar echo. See Radar
Morse code. See Keying
Motors, selsyn, 1702
Multivibrators, analysis and design, 2160
equivalent circuit, 307
locked, automatic control for, 474
low frequency, 884
theory, (A) 1798
Musical instruments, electronic, melodium, 841, organ, 2668, 3391
violins, mechanical action, 840

N

Navigation. (See also Blind landing; Compass; Radar; Radio beacons)
aerial, (B) 628
altimeters, (A) 1528, 1863, 2587
telemetry, 1546
u.h.f. course-indicator, 932
hyperbolic. (See also Radar); (A) 923, (A) 1528
long-range, operating systems, (A) 1528
marine, fog signal telecontrol, (A) 1862
new set, 2910
radar aids, 2911, survey, 3291
pulse systems, 927, (C) 1245
—— **aids.** (See also Decca navigator)
aerial, radio and radar, 1547; civil aviation, 3296; Consol beacon, 2912; landing, v.h.f., 627; radar buoy, 3615; radio-range, 2200
Negative feedback. See Feedback, negative
Networks. (See also Circuit theory; Impedance; Matrix theory; Quadripoles)
a.c., calculator for, 47
analysis, (B) 2169
attenuating, 60, 880
balancing, for cables, early, 297
bridged-T null, 1465
delta, analysis, 860
four-terminal, graphical solutions, 1786, 2500
response to f.m., 1463
ladder, terminations, 3539; transients in, 2836
linear, pulsed, (B) 582, 1216, 1502, theory, (A) 2150
matrix theory, 55
negative transconductance, 2157
RC parallel-T, 1464, 2840
T and π equivalents, general formulae, 866
theory, pulse response, (A) 562
two-terminal, simulating aerial, 553
Neutralization in amplifiers, power, 577, v.h.f., 893
Nickel. See Films
Night sky, spectrum, 2904
Noise. (See also Amplifiers; Cosmic noise; Fluctuation; Interference; Solar noise)
acoustical, discrimination, differential microphone for, 1160
reduction, anticipator circuits for, 24
aerial, receiving, 2699
from electrical contacts, 3263
limiters in c.w. reception, 2302
mains hum, suppression, 3031
meters, calibration, 2248
in pulse-modulation systems, theory, 2307
source, up to 5 Mc/s, gas discharge tube, (A) 3487
valve and circuit, impulse, in f.m. receivers, (A) 1649
in radar crystal detectors, (A) 3725
receiver, 176, 1039, microwave, 1665
rectification, 971
shot effect, 3126, and thermal, theory, 1038, (A) 3021
spectrum, of crystal mixers, (A) 1649
theory, 1037, (A) 2696
thermal, general formula, (A) 2300
Nomenclature, geonomy, aeronomy, 1833
Nomograms. See Charts
Nonlinear problems, circuit applications, 3554
empirical laws, 3195
oscillatory equation, solution, 963
small parameter method, 106
—— **systems**, automatic control, robot dynamics for, (A) 3831
theory, 2834
Null indicator, bridge, 123, 672, 2634

O

Ohmmeters, circuit for, 1291
Operational calculus. See Calculus, operational
Optical systems, directive, 751
Orthicon. See Television apparatus
Oscillations. (See also Piezoelectricity)
e.m., in solids and cavities, 3211
forced, differential equation solution, 3656
in spherical resonators, 320
in hot-cathode arcs, (A) 3266, effect of magnetic field, (A) 3267
of low-pressure discharge, 2871, 2872
nonlinear, solution of, 106
parametric, of iron body in alternating field, 2546, 2880
parasitic, and suppression in r.f. amplifier, 1714, 2772
in random phase, probability distribution, (A) 2962
relaxation, kinematic definitions, 2525
synchronization theory, 111
self-excitation and regeneration, 881
Oscillators. (See also Klystrons; Magnetrons; Ultra-high-frequency generation)
a.f., circuits and construction, 3169
Barkhausen, 803
bimodal, 1485
blocking, as timer, 62
crystal, series-resonant, 2524
forced oscillations and synchronization, (A) 882
frequency of, formula, 570
general theory, (B) 591, (B) 2859
LC, stability, 569, (A) 2523, (D) 2850
l.f., with high harmonic content, 3217
line, construction, 3102
linear saw-tooth, 2526
locking phenomena, 2522
magnetostrictive, for supersonic use, (A) 1147
microwave, (A) 2083, frequency stabilization, (A) 1576
permeability-tuned, 3103
phase-shift, 1207
piezoelectric for a.m., f.m. and television, 573
improving stability, (A) 1294
theory, (AD) 682
in v.h.f. receivers, 170
power relations, 3216
RC, 306, two-phase, 3218, three-phase, 1796
temperature-compensated, design, 241
test. (See also Test equipment)
17 c/s – 218 kc/s, 2158, 40 – 500 Mc/s, 2651
transitron, highly stable, 1389
two-terminal, and applications, 2157
u.h.f., electron-optical theory, 2775
vacuum contained, h.f., 1403
variable frequency, 2848, non-crystal, 3808
with 6K4 miniature triode, 2149
Oscillatory systems, with one degree of freedom, 3230
Oscillograms, coloured-trace, 2239
Oscillographs and galvanometers, (B) 689
Oscillography. See Cathode-ray oscillography
Ovens for quartz crystals, 759, 3070; thermostatic, design, 758
Overload protection, electronic, for meters, 1584
Oxide-cathodes. See Cathodes, oxide
Oxygen, absorption of ½-cm e.m. waves, 3396; microanalytic estimation of production, 988

P

Packaging. See Protection; Tropicalization
Particle accelerators. (See also Electron accelerators)
cavitron, 2037
pulse technique for, 2997
survey, 1311
wave guide as, 3789
—— **emission**, spontaneous, at r.f., (A) 3580
Particles. (See also Betatrons; Cyclotrons; Electrons; Protons)
charged, acceleration, 439, (D) 2036, (D) 2038
effect of revolving magnetized bodies, 75
negative protons, (A) 3571
Patents, American, commission, (A) 2418; pool for radar, 494
British, law reform, 3490, proposals, 501, 3139
Pentodes, dynamic characteristics, use, 2846
re-entrant, in a.f. amplifier, 3122
Permalloy tape for h.f. transformers, (A) 2014, 2225
Permeability, of ferromagnetic materials, at h.f., 90, 645, (A) 2608
initial, increase with elastic stress, 354
of Ni, for cm waves, 2924
—— **tuning**, 578; oscillators, 3103; tracking circuits, 3224
Perveance, 2774
pH meter, (A) 674
Phase inversion, for obtaining resonance, 1207
inverters, 2516, circuit, (D) 1194, self-balancing, analysis, 1195
modulation. See Modulation, phase
relationships, reversed polarity, 1794, 2519
shifter, nomograph, 2161
Phasitron phase-modulating tube, 1405, 2092
Phosphorescence. (See also Fluorescence; Luminescence); 1808
Phosphors. (See also Luminescent materials)
brightness, and wavelength, 2922, 2923
decay characteristics, measurement, 2594
excitation, corpuscular *vs* undulatory, (A) 3821
growth and decay, 3240
infra-red sensitive, 3301, (A) 3622
properties, manufacture and use, 1272, 1273
in television, 1272, 1273
temperature-limit of luminescence, 447
ZnS, with periodic excitation, 2593
Photocathodes. (See also Cathodes, oxide)
caesium oxide, energy distribution in, (A) 2032, 3782
physical properties, (A) 2033, 3781
complex, 3780
Photoconductivity of alkali-halide crystals, 1817
in Si crystals, (A) 3620
Photoelectric cell applications. (See also Biological applications, Electronic applications; Electronic devices)
cartridge case inspection, 1016; colorimeter, 987; detection of unmodulated light, 1088; fish counter, 1630; furnace discharge indicator, 390; modulator for ionosphere recorder, 2049; photometry filter, 3567; reading aid for blind, 3700; solar telescope, 2656; spectroscopy, (A) 1310; street lighting control, 3379; textile weft straightening, 1020; timing of moving body, 3681
—— **cells**, blocking layer, 3785
bridge type, (A) 3784
cooling of, 2724
emissive, colour response, 437
h.f. rectification, experimental, 2725, theory, 2726
and human eye, 2361
use of light metals in, 3768
multiplier, for spectrochemical analysis, 385
with Sb–Cs cathodes, (A) 2031, 3783
with secondary electron mechanism, (A) 2029
selector for, 1697
selenium barrier-layer, 214, test gear for, 2035
electrolytic, 2034
in technology, (B) 784
thallous sulphide, (A) 3624
—— **effect**, with complex cathode emitters, (A) 1819
falling-off effect, and polarized light, 3232
in germanium, (A) 3314
of metallic films, (A) 1504
Photoelectricity. (See also Electron multipliers)
of finely-divided metals, 2921
Photography, colour printing, photocell control, 2658; in engineering, (B) 1897; high-speed, of c.r.o., 1683; lens types, 3080; in research, 1568; sequence timing, 1320
Photometry, filter using photocells, 3567
Photorecording, coloured-trace, of oscillograms, 2239
Physics. (See also Particles)
collision theory of particles, 1810
diffusion of atoms and molecules, 2211
electronic, (B) 3269
and mathematics, false conceptions, 502
molecular beams and r.f. spectroscopy, (B) 1233
new classical theory of photon and electron, 905
oscillation of elastic sphere, 109
Planck's radiation formula, 2865
turbulence, statistical theory, 1503
Pickups, carbon, 3161
crystal, compensating circuits, 535
design and tracking error, theory, 21
f.m., (A) 1152, 1752, circuit, 2853
low impedance, 1154
magnetic, 1153
modulated-oscillator, improved circuit, 2795
moving coil, high fidelity in, 833, (C) 1762; Lexington type, 2453
torsional magnetostriction, 2454
variable reluctance and strain gauge types, 2115
Piezoelectric crystals. (See also Crystals; Quartz)
apparatus for growing, (A) 1263
dimensioning, 683
effect of X rays, 126
forced vibrations of, 3244
grinding, 1875
KDP and ADP, electric and elastic properties, (A) 1260, 2208, 2925
method of orienting and cutting, (A) 1262
oven for, 759, 3070
research, 1873
shear modes, 684
in wave filters, 3196
Piezoelectricity. (See also Crystals; Oscillators; Quartz; Rocksalt)
control of twinning in quartz, 1874
figures of merit, (A) 1264
oscillation theory, (A) 1265
Plasma, absorption of light, 2542
behaviour in magnetic fields, 3577
disintegration, 1812
generalized conception, 3576
kinetic theory, 1810
oscillations, high power, 2872; in mercury arc, 2871; and relaxation, 1811
small perturbations, 1224
waves and electron beams in, 1813
Plastics. (See also Polyethylene; Polymers; Polythene; Silicones)
aminoplasts and vinyl resins, (B) 3649
effect of humidity and fungi on insulation, 1562
electrical properties and dipole theory, 585
for electrical and radio engineers, (B) 1896, (B) 2952
friction bonding, 1566
h.f. heating, 151, 394, 3696
hydrocarbon and ceramic, development, 2932
methods of working, 1892
paper-based, resistivity, 1269
polyvinyl chloride, strength, 958
properties, 100, tropical, 349
and uses, 652, 653, (B) 961, in electrical industry, 3642, 3643, in radio, 959, in scientific instruments, 1567
surveys, (B) 359, 956, 957, (B) 960, 1893, (B) 2233, 2948
Plating. (See also Surfacing)
screw clearances, 2940
Polarization. (See also Wave propagation, electromagnetic)
vertical *vs* horizontal for television, 2239
Polyethylene for r.f. cables, (A) 2130
Polymers, high, expansion anomaly in, 350
moisture characteristics, 1560, 2936, 3641
molecular weight studies, 351
thermal transition in, 2938
Polythene, dielectric properties, h.f., (D) 638, (A) 2222, v.h.f., 2937
effect of temperature on structure, 640
thin films, structure and orientation, 639
Position location. (See also Blind landing; Direction finding; Radar)
by sound, 3164
Potentiometers, d.c., 2972
high-speed recording, (A) 1576
magnetic, for B-H curves, 3349
Power. (See also Converters, power; High voltage)
losses, capacitors and inductors, 3213
measurement, a.f., 1284
microwave, 118, (A) 1578, load lamps for, 2638
with oscillograph, 2637
speedomax recorder, (A) 1576
supply, a.c. operated, for U.S. army instruments, 2733
mains, for battery receiver, 725; frequency doubler, 2351
polyphase, for valves, 863
portable, rotary converter for, 3787
r.f., 3079
stabilized d.c. h.v., 1388

television, **2349**
thermoelectric, portable, **2734**
vibrator, 350 W, **2352**
voltage regulated, **756**, **1076**, **1688**, multi-voltage, **3796**
6 V, d.c., **2350**
unit, r.f., for c.r. tube, **2045**
Precipitation static and aircraft, **2322**, **2323**, discharger, (A) **2437**, electrification of aircraft, **1993**, h.v. generator for study, **2344**, instrumentation, **1992**, problems, **1991**, research, **3038**
Preservation. See Protection; Tropicalization
Pressure, high, production by freezing, **2595**
measurement. See Manometers
Probability, distribution of randomly phased oscillations, **1908**, (A) **2962**
Production. (See also Industry)
aids to, **1137**
methods for receiver construction, **2443**
testing. See Control, quality
Propagation. See Wave propagation
Prospecting, geophysical, equipment, **702**; impedance method, **3710**
Protection, cathodic, of buried metal structures, **93**
packing, against corrosion and shock, **520**, **2104**; dynamics of, **2105**
Proton microscope, **2659**, **3384**
Protons, negative, (A) **3571**
Public address systems. (See also Loudspeakers; Sound reproduction)
in auditoria, **531**, **1162**, **1163**, **1438**
military, **532**, **2802**
Publications, Annales de Radioélectricité, **1142**
bibliography, of electronic engineering, (B) **2108**, **2655**
Communication Review, **748**
dictionary of electronics, (B) **1741**
directory of U.S. broadcasting stations, **2708**
U.S. electronic engineering, **1418**, **2610**
Electrical Engineer reference book, (B) **1140**
Electronic Engineering Master Index, (B) **3155**
Electronics Buyers' Guide, **3489**
Electronics Laboratory Manual, (B) **1742**
Journal of Polymer Science, **3307**
Philips Research Reports, **2412**
Radiation Laboratory Technical Series, (B) **1549**
Radio Propagation Bulletin of C.S.I.R. Australia, **3002**
Waves and Electrons, **1122**, **1740**, **2410**
Pulse modulation. See Modulation, pulse
Pulses, circuits, **2161**, **2527**, for timing, **2159**
c.r.o., duration measurement, **3663**
generators, high power, **2761**, rectangular pulse, (A) **1486**, with synchronizing pulse, **1210**
measurement of characteristics, **1599**
shape, Fourier analysis, **116**
technique, applications, **3754**
Pumps. (See also Vacuum technique)
diffusion, oil, **938**; theory, **1868**, **1869**
vacuum, silicone oils for, **357**; various, **356**

Q

Q of capacitors, measurement, **49**
Q meter, cathode-ray, **671**; construction, **2648**
Quadripoles, theory, **3202**
Quality control. See Control, quality
Quantum mechanics, divergence-free, **2861**; interaction of electrons, (A) **1218**
Quartz. (See also Piezoelectric crystals)
breaking up of single crystals, (A) **3310**, recrystallization, **3311**, (A) **3627**
saw for cutting, **2949**
smoky, elasticity and coloration, **3309**
synthetic, preparation, **3312**
—— **clocks,** for astronomical work, **3388**
—— **crystals.** (See also Crystals; Piezoelectric crystals); (B) **2951**
activity measurement, **969**, **2625**
aging, **685**
characteristics and uses, **91**
duplex, **1582**, (A) **1918**
effect of X rays, (A) **1265**
harmonic oscillation, **471**
measurement of performance index, (A) **1296**
orientation determination, **339**
plating, by evaporation, **941**, various methods, **2227**
——— **units,** (A) **1700**
air-seal test set, **441**
characteristics and measurement, (A) **1576**
—— **plates,** etching and steam treatment, **1261**
gold film electrodes for, **3794**
—— **resonators,** and X-ray irradiation, **2228**

R

Radar. (See also Blind landing; Fuses, proximity; Navigation; Radio beacons; Testing)
anti-aircraft, **611**
apparatus, aerials, **2486**; descriptive survey, **2195**; transmitters and receivers, **2751**; t.r. switches, **2783**; valves for, **2778**
applications, aircraft speed measurement, **397**; in Bell System, **88**; civil, **3289**; civil aviation, **1859**; military, **2967**; navigation, (A) **1244**, and obstacle detection, (A) **1847**, **2580**; storm location, **618**, **1541**
beacon, theory and application, (A) **1528**
camouflage, **1648**
countermeasures, **1060**, **1061**, **1356**, **1527**, **1853**, **2586**
c.w., circularly polarized, **2908**
display systems, **330**, **616**, **1857**, skiatron for, **2404**, for training, **1858**
early warning, **1249**, **1536**
echoes from birds, **332**, **333**
equipment, G.P.O., **1540**, various, (A) **1528**, 50 cm, **1535**
factors affecting range, **3607**
Ferranti manufacturers' display, **989**
fire control, **608**, **609**, **610**, **1250**, **1528**, **1534**, **1537**, **2581**
gee and oboe, **927**
ground controlled approach, (A) **1528**
history, **86**, **327**, **615**, **1854**
hyperbolic navigation, (A) **923**, (A) **1528**
i.f.f., **1539**
interpretation of observations, **1540**
loran, **605**, **924**, **926**, **1243**, **1531**, **1532**, **2191**, **3287**, **3288**, **3608**, **3609**, indicator circuits, **606**, **1529**, and ionospheric propagation, **2190**, specialized, **925**, transmitting stations, **1530**
marine, **2194**, **2578**, (B) **2917**, **3292**, **3611**, **3612**
to moon and planets, **1856**, **2197**, **2585**
naval, **613**, **614**, **1246**, **1247**, (A) **1847**
for offence, **85**, **328**, blind-bombing, **2196**, **2579**
principles and surveys, **83**, **928**, **930**, **931**, **1245**, **1533**, **1538**, (A) **1847**, **1851**, **1852**, (B) **2201**, (B) **2308**, (B) **2446**, **2577**, (B) **3016**, **3285**, **3286**, (B) **3298**, **3610**, **3812**, convention, (A) **1850**, **2576**
shoran, (A) **1847**, **2193**
systems, aircraft, **2909**; navigation, **1849**; various, **84**, **87**, **329**, **608**, 612, (C) **1248**, (A) **1847**
technique, French developments, **3290**; pulse circuits, **2527**
test equipment, **3045**; artificial target, **1542**; for field maintenance, (A) **1576**
trainer, supersonic, [illegible]
Radiation. (See also Acoustics; Aerials)
e.m., aerial, phase structure, effect of earth, **1639**
from dipole, in refracting medium, **314**
resistance. See Aerials
Radiators. (See also Aerials)
directive, small, acoustic and radio, **367**
Radio, development, **1941**, **2100**
English law, **1136**
modern, (B) **814**
for operators, (B) **2790**
and television, developments, **222**, practical, (B) **2789**
U.S. navy, **417**
Radioactivity, new units for, **3586**
Radio beacons, aircraft, **2199**
modulation circuit, (A) **1548**
responder, **620**, **621**, **1253**
—— **engineering,** future programmes, **2099**
—— **equipment,** enemy, (A) **1528**
Radiography, gamma, technique, **3594**
microsecond, (A) **1613**
secondary electron effect, **3000**
Radiology, industrial, **105**, bibliography, (B) **1327**
Radio propagation. See Wave propagation, electromagnetic
—— **range.** See Radio beacons
—— **servicing.** See Servicing
Radiosonde, application of u.s.w. d.f., **1864**
for cosmic-ray observations, **2986**
equipment, American, **2280**
for potential gradient recording, **1955**
testing, **396**
Radio telephone. See Relay systems
Reactance, calculation by geometric mean distances, **3552**
comparator, **380**
measurement equipment, **122**; frequency variation method, **1579**
variation device for, **3795**
Receivers. (See also Aircraft communication; Radar; Servicing; Television apparatus)
aircraft, 10-channel, **3033**
all-purpose, **407**
amateur-band, **1980**, **3030**, superheterodyne, **409**, **411**, **1343**, tuning system, **2297**
army set R107, **174**
automatic selectivity control, **1664**
broadcast, design for home use, **3735**
low voltage d.c., **2292**
new Swedish, **1651**
post-war design, (D) **714**
production statistics, **2107**
servicing data, **2293**, **2681**, **2683**, **3027**
Sobell 615, test report, **3028**
superheterodyne, three-valve, **1961**
tuned circuits for, **1803**, (A) **2856**
conversion from 14 to 112 Mc/s, **1652**, from 112 to 144 Mc/s, **409**
cooling of, **1419**
crystal-controlled, for a.m., f.m., and television, **573**
design, (B) **414**, (B) **728**, (B) **3040**, **3401**, conference, (A) **1978**
f.m., (A) **1654**
crystal-tuned, **169**
discriminators for, (A) **1462**
impulse noise in, (A) **1649**
interference in, **172**
signal strength selection, **2291**
f.m./a.m., constructional details, **718**, 15–170 Mc/s, **3034**
heterodyne, crystal rectifiers in, (A) **1649**
midget, German, **2294**
mobile, metre-wave, **3732**
noise components, **176**
panoramic alarm system, **3078**
pocket, **717**; time-signal, **1954**
power output stages, **722**
Pye 15A test report, **1031**
R.A.F., type R.1155, **3029**
regenerative, **2687**, 4.5–665 m, design, **719**
remote tuning, **1340**
sensitivity, manufacturing limits, **715**
specifications, suggestions, **173**
superheterodyne, communication, **3734**
frequency conversion, **2692**
frequency drift in, **1342**, **1646**
oscillatorless, **1660**
superregenerative, **2690**, 144 Mc/s, **1655**, **1656**, 420 Mc/s, **2757**
u.h.f., German, **1648**
naval communications, design, (A) **1649**
various, circuit diagrams, **2680**, **3402**
v.h.f. battery-operated, **2295**
laboratory, circuits, **1293**
selectivity measurement, **2621**
servicing, **1657**
tunable, (A) **1649**
Reception. (See also Distortion; Interference)
c.w., single-signal, **1659**
diversity, CAA Alaskan, **2002**
exalted-carrier, a.m. and ph.m., (D) **1345**
f.m., with multipath propagation, **2321**
frequency deviation system, **3736**
panoramic, **1653**
of vertically polarized waves, **1179**
Recorders, c.r.o. 6-channel, **3073**
disk, B.B.C., **832**
magnetic, for home receiver, (A) **1431**
for transients, **217**
meter, power-operated, **1368**
morse, construction, **216**
pen, analysis and constructional details, **1683**
high accuracy, automatic, **379**
potentiometer, for flight-testing and spectroscopy, **2249**
[illegible], **2462**
Recording. (See also Photorecording; Sound recording)
automatic, instruments for, **1691**
disk, glossary of terms, **20**
magnetic tape, B-H curve tracer, (A) **2014**
signal and noise levels, (A) **1754**
Records, sound. See Sound recorders
Rectification, contact, **2217**
between different crystals, (A) **3628**
h.f., efficiency in crystal detectors, (A) **3636**
by semiconductors, **2601**
of signal and noise, **971**
Rectifiers. (See also Dielectric properties)
barrier layer, contact e.m.f., **1519**
capacitor-charging, **1364**
copper oxide, in a.c. voltmeters, **1588**
effect of temperature gradient, **2802**
crystal, contact capacity, (A) **3631**
contact potential, (C) **2179**, (A) **3465**
germanium, (A) **944**, effect of atmosphere, (A) **3635**, h.v. and photo-effects, (A) **3634**, and Si, d.c. characteristics, (A) **3630**, (A) **3633**
in heterodyne receivers, (A) **1649**
h.f., survey, **2977**
image force and tunnel effect, (A) **3632**
theory, (A) **3629**
for u.h.f., **3186**
for high-power transmitter, **395**, **396**, (A) **1072**, (A) **1073**, (A) **1736**, (A) **2019**, (A) **2020**
lead sulphide, anomaly, **2562**
use of light metals in, **3766**
nonlinear, empirical laws, **3195**
selenium, construction and performance, **1363**
Reflection, acoustic, from solid objects, (A) **1766**
of light, diffuse, **1889**; Fresnel's formulae, (A) **1887**
u.s.w., by ground and water, **2673**
Reflectivity of optical coatings, theory, **312**
Reflectors, paraboloid, testing, **2866**
Refractive index and thickness of thin films, **2538**
Regulation. (See also Control)
automatic, stability, **2784**
electronic, machine tools, **2250**
Relativity, Lorentz transformations, derivation, **1217**
Relaxation methods, for solving Laplace's equation, **658**, **1578**
survey, **2617**
oscillations. See Oscillations, relaxation
processes, thermodynamics of, (A) **3587**
Relaying, slow speed, **195**
Relays, applications and design, (B) **2356**
army equipment, **1353**
control circuits, **1321**, **2722**
electric, survey, **3775**
Relay systems, a.f., dialling, **3793**
f.m., **743**
microwave, **1055**, **1056**, possibilities, **422**, Raytheon, **186**, **2308**
television, **187**
pulse-modulated, **2315**
stratosphere, **3801**
Remote control. See Control, remote
Repeaters, telephone, rural, **3045**
Research. (See also Industry; Laboratories)
and the community, **254**
at Davy Faraday Lab. on crystals, **1873**
D.S.I.R. grants for, **3130**, D.S.I.R. programme, **3129**
electrical, Russian, **495**
industrial, American, (B) **1138**; British, **1118**, **1410**, (B) **3154**; B.T-H., **2413**; E.R.A. annual report, (A) **2414**; in France during war, **1105**
influence on war, **506**
naval organization, **1117**
scientific, use of aviation, **3132**; and industrial post-war, **492** **493**, **3128**
telecommunications, G.P.O., **2417**
Resins, h.f. hardening, **1001**
Resistance, h.f., of iron wire and permalloy strip, **1266**
of Hg, temperature dependence, **1877**
insulation, measurement of, **3667**
of liquid alkali metals, **342**
materials. (See also Alloys)
for standard resistances, **3321**
measurement at high impulse voltages, **669**
survey, **1292**
of wires, h.f., **367**
nonlinear, design sheet, **1777**
T-pad, design, **298**
Resistivity of rare oxides, **946**
Resistors, carbon, high stability, **1690**
nonlinear, **3554**
non-ohmic, silicon carbide, (A) **1885**, (A) **2606**
standard, **3321**
as transmission lines, **1177**
wire-wound, silicone coating, (A) **2215**
Resnatron, construction and properties, **1732**
principles, (A) **3822**
Resonance, electrical, using phase inversion, **1207**
Resonators, cavity, semi-transparent, **1795**
microwave, **2520**, circle diagram, (A) **3555**
spherical, forced oscillations in, **320**
Responder, radio-acoustic, **335**
Reuters' news service, **3749**
Rocksalt, effect of pressure on conductivity, (A) **1557**
Rotalix tubes, **3075**
Rotation, nature of, **3564**
Rubber, dielectric heating, for curing, **1617**, **1618**, for vulcanization, **3695**
structure and vibration insulation, **96**
synthetic, electrical properties and dipole theory, **585**
vulcanization, **2221**

S

Safety, electrical, accidents in factories, (D) **1130**; electric shock, treatment, **508**; precautions for transmitter operation, **2432**
Salt solution, r.f. properties, **1880**, **2549**, (A) **3315**
Saw for cutting very hard materials, **2949**
Scattering. (See also Wave propagation, electromagnetic)
in circular waveguide, (A) **3542**
at half-light, polarization and ionization, **1641**
of light by electrons, **2537**; theory, **1222**; in turbid medium, theory, **2866**; by water drops, **1506**
microwave, at sea surface, (A) **3718**
Rayleigh, modified, in liquid, **2867**
Science. (See also Research)
contribution of B.B.C., **3140**; in Czechoslovakia and Yugoslavia, **3141**; and education, **3144**; and government, **1409**; publicity, (D) **1119**; and war, **2419**, (A) **2420**
Screenings of circuits, **1179**
e.m., cylindrical, theory and measurement, **2167**
intensity near aerial cage, **3184**
magnetic, of telephone transformers, **3429**
screened room design, **2046**; for r.f. heating generators, **2441**
testing of conduits, **1800**
Screens. (See also Cathode-ray tubes)
electromagnetic, power loss in, **1077**, **2716**
fluorescent, X-ray, microwave decay, (A) **3302**
Screws, clearances before plating, **2940**
Sealing. (See also Vacuum technique)
coppered tungsten to glass, **2591**
evacuated tins, **1554**
glass to metal, **97**, **935**, **1553**, **3618**
hermetic, **811**, **2106**
NaCl to glass for infra-red cells, **2205**
Seismology. (See also Wave propagation)
seismic waves, **3565**
Selenium, amorphous and crystalline, properties, **3308**
Semiconductors, complex photocathodes regarded as, **3780**
effect of grain structure, (A) **3636**
effect of h.f. a.c., **1882**
heat treatment, and contact rectification, **2217**
impurity, energy levels, (A) **3316**; scattering, **2216**
principles and properties, **345**, **346**, **2218**, **2601**
voltage fluctuation in, (A) **2683**
Sensitivity, limiting, of energy detectors, **106**
Servicing. (See also Signal tracer; Test equipment)
aircraft equipment, **2442**
receivers, **1663**, **1664**, **2683**, (AD) **2686**, **2689**, **3493**, **3494**; equipment, **3364**; insurance scheme, **3506**
Servomechanisms. (See also Automatic control)
electrical analogy, **1362**, amplifier, **296**, **512**
frequency-response analysis, **3764**
parallel circuits in, **3763**
theory, (B) **1375**, **1907**, (A) **2012**, linear, (A) **1760**
Ships, magnetic field under, **2682**
Shock. See Vibration
electric. See Safety, electrical
Signal generators, construction, **3355**
h.f., f.m., **2254**
high precision, quartz, **3354**, **3363**
new, **1289**, **1686**
output standardization, **3357**
RC, (A) **1925**
television, **2255**, **2646**, **2960**
wobbulator, **2643**
65 kc/s–34 Mc/s, **1685**; 100 kc/s–150 Mc/s, **1287**; 160 kc/s–8 Mc/s, **3358**; 135–500 Mc/s, **1288**
Signal/noise ratio in multiplex systems, **2068**
at v.h.f., in triode amplifiers, **3749**
Signal tracer. (See also Servicing)

description and circuit diagram, 1920
for receiver servicing, 985
r.f.-a.f., 1299, 2642
Silica, crystallizing action of water and KOH solution, 2926
Silicon, high purity, photoelectric properties, (A) 3784
—— **carbide resistors,** (A) 1885, (A) 2606
Silicones, 2931
coating for resistors, (A) 2215
as diffusion pump oils, 357
for electrical machine insulation, 98, 99
for water-repellent surfaces on glass, 2214
Skiatron in radar display, 2404
Slide rules, for r.m.s. calculations, 2816, 2955, 2956, 3333
Societies and organizations, A.I.E.E. report on engineering profession, 2411; electron tube engineering council, (A) 1730; for engineer in civic affairs, 498, 500; engineering profession, 499; International Council of Scientific Unions, 1116; Radiation Laboratory, M.I.T., 1251; Radiodiffusion Française, programme, 2318
Soil, electrical properties at 2 and 5 m, 711, (A) 1022; resistivity, 1523; seismoelectric phenomena, 2189
Solar activity. (See also Geomagnetism; Ionosphere; Sunspots)
and geomagnetic activity, 1828, 2566; data for July/Sept. 1945, 594, Oct./Dec. 1945, 1821, Jan./March 1946, 2554
—— **corona,** effect on ionosphere, 77
hard radiation from, 2860
—— **cycle.** See Sunspot cycle
—— **eclipse.** (See also Ionosphere)
and atmospheric potential gradient, 2561
radio observations, 165
of 1945, and radio wave propagation, 1831, (A) 3277
—— **noise,** 76, 323, (D) 917, 1521
during fade-out of 17th Aug. 1945, 1824
on 1.5 m in Oct. 1945, 1823
on 4–6 m band in Feb. 1942, 1825
—— **radiation,** charged particles and ionosphere, 2889
corpuscular, solid angle, 2555
and geomagnetism, 2557
and ionospheric and geomagnetic observations, 1827
microwave, (C) 2182
radio frequency, 1826
Soldering, of field-telephone wires, 358
by r.f. heating, 1616
with Sn-Pb alloys, 2944
Solders, soft, damage to wire, 2230, jointing capacity, 2943
Sonar, 1750, 2452, [illegible]
Sonobuoy, 1855
Sound. (See also Acoustics)
analyser, Gen. Radio, range extender for, 2456
attenuation in circular ducts, 257, (C) 2113
position location by, 3164; see also Sonar; Sonobuoy
pressure measurement, microphone for, 2459
radiation in water, 1744, 1745
Rayleigh's boundary wave, 2863
sound effects, (B) 1444, circuit, 1151
theory, (B) 842
waves, reflection and refraction, 2862, 2864
—— **absorption** of fiberglas, 1156, 1430
measurement, using Helmholtz resonator, 1155
for sound-proof rooms, (B) 844
in metals, 2448
and scattering by cylinders, 2112, 3162
—— **distribution.** See Loudspeakers; Public address systems
—— **film,** f.m. control track, 272
intermodulation test, 271
noise-reduction systems, 273
—— **propagation** over absorbent surfaces, (A) 3511
in air, 1427, outdoor, 1423
in atmosphere, 3510
in liquid layer, 1422
in tubes with plane discontinuities, 815, 816
in turbulent atmosphere, 1432
wave equation for varying refraction, 2170
—— **recorders,** embossing, Recordgraph, 2462
postwar, 539
—— **recording.** (See also Gramophone; Recording)
in aircraft, 2803
for air traffic control, 2126
disk, (A) 2125, performance, (A) 1754
film, colour film, tests, 2805
equalizers, 526
intermodulation distortion, 1157
mobile unit, 23, 25
noise-reduction, 24
production technique, 260
re-recording console, 22
stereophonic equipment, 5, 9, light-valve for, 8, Stereophon, 2128
survey, 831
voice-controlled, Hartron, 537
improvements, 534
of machinery noise, 18
magnetic, 536, (A) 836, (A) 1164, (A) 2125
magnetophon, 538, (A) 834, 2463
multiple, 835
signal and noise levels, 2964
theory, 3167
wire recorder head design, (A) 1754, 2127
in Nuernberg trials, 2457
office equipment, (A) 1754, Sound Scriber, 270
underwater equipment, (A) 1431
Western Electric system, 19
wire. See Magnetic wire
—— **reproduction.** (See also Gramophone needles; High fidelity; Loudspeakers; Microphones; Public address systems; Television)
audio characterist., 383
film, cinema, 3
colour film, photocell for, 3076
contrast expanders, 10
multi-speaker system, 2
photocell for, 2806
stereophonic, 4, 5, 2798
gramophone design, (A) 1754
high fidelity, problems, 258, quality, 2797
tracking-error analysis, 21
—— **sources,** conical, 266, (C) 2123, (A) 3169
moving, sound field of, 2793
standard, 522
study of, (A) 3157
—— **spectrograph.** See Visible speech
Space charge between coaxial cylinders, theory, 486
effect on current, 796
in magnetrons, cylindrical, 3478, plane, 3477
Spark discharge in gases, theory of formation, 909
stepped breakdown, 2870
—— **gaps,** erosion, 3436
tungsten, oxidized, 1886
Specifications, preparation and use, 3145; statistics for, 3146, 3147
Spectrochemical analysis, with c.r.o., 2266
multiplier photocell for, 385
Spectrographs, exposure control, 1932
mass, electronic, for, 132
Spectrometers, beta-ray, theory, 1231
X-ray, for crystal axis determination, 3058
Spectrometry, spectral intensity measurements, 2274
Spectroscopy, infra-red. See Infra-red
photocell, (A) 1310
r.f., and molecular beams, (B) 1233
Spectrum. (See also Absorption)
analysers, r.f., 979
infra-red, of heavy water, (A) 3239
r.f., of diatomic molecules, (A) 3233
Speech, effect of altitude, (A) 3522, (A) 3523
intelligible transmission of, (A) 3526
intelligibility, effect of distortion, amplitude, (A) 3524, frequency, (A) 3525
inverted, 13
masking of, (A) 3527
visible. See Visible speech
Stability. (See also Frequency; Oscillators)
of electrical systems, theory, 567
of regenerative circuits, Nyquist diagram, 2842
Stabilization. (See also Frequency; Voltage)
current, circuit analysis, 48
and voltage in X-ray tube, 2330
oscillator, 241
Standard frequency. (See also Frequency standard)
—— —— **transmissions,** WWV, 1580
Standards, proposed by American R.M.A., 2101
Static. (See also Precipitation static)
atmospheric, effect on aircraft radio, 3143
production, mechanisms, 908
Stations, design and planning, 1058
f.m., range prediction chart, 736
power increase, KOTA, 1057, WSPR, 239
Statistics. (See also Control, quality; Probability)
in counter technique, 3336
discontinuous random processes, 1574
elementary, (B) 3340
linear 'curves of best fit', 2960
number of observations for given accuracy, 3335
sampling, (B) 812
significance test, 2427, 3492
Stereo-episcope, 504
Storm location, 618, 1541, 1860, (A) 3293
Strain gauges, electrical, principles of operation, 2990, survey, 694, 3368
resistance, 3691, applications and circuits, 2262
—— **measurements,** l.f. amplifier for, 1479
Stratosphere. See Atmosphere
Stratovision system, 2370, 3801
Stress distribution in compressed cylinder, 108
measurement, electrical, (A) 1933
Stroboscope, circuit for, 2785; gas discharge tube for, 1729; light-flash, 2050; timing, 1320
Studios. See Broadcasting; Television
Submarine detection, 1750, 1855, 2452
Sun, magnetic field, 2888, and cosmic radiation, 75, 322, theories, (A) 3275
spectrum, 2556
Sunspot cycle, effect on propagation, 1235, 2284
predictions of next maximum, 324, 2560
secular variations, 1830
Sunspots. (See also Ionosphere; Solar activity)
of Feb. 1946, and cosmic rays, 2887, and radio communication, 3015
magnetic field, 2890
numbers, provisional, July/Sept. 1945, 595, Oct./Dec. 1945, 1829, Jan./March, 1946, 2559
relative, for 1945, 2558
structure and characteristics, 2183
Superconductivity of lead at λ 3 cm, 3258
theory, 2541
Superconductors, h.f. resistance, 3593
thermoelectric phenomena, 2176
Supersonics, absorption measurement in gases, 2450, and liquids, 2794
applications. (See also Flaw detection); (B) 280; degassing of molten metal, 392; radar trainer, 2582; reflectoscopy, 822, 3515; strip testing, 1424; water-depth sounder, 3163
echo observation, (A) 3514
generator, 1748
interference at angular reflection, (A) 1146
use of magnetostrictive oscillator, 1147
possible corpuscular nature, 904
principles and results, (B) 843
velocity in water, 2449
Surface finish, electrolytic polishing, 2226, of Al and alloys, 648
water-repellent, silicones for, 2214
hardening, of steel, h.f., 697, 3693
varnished, infra-red drying, 699
Surfacing. (See also Electroplating; Films, thin; Protection)
conversion coatings on metals, 942
metallizing ceramics, 2945
quartz crystal plating, 941
Switches, coaxial, 283
directly-coupled pentode, 2496
electronic, 2025; for counter system, 2148; 4-channel, 1780
r.f., for broadcasting transmitters, 2139, (A) 3180
thyratron, pulse response, 1186
t.r., 2783, (A) 3814; bandpass, (A) 3816, (A) 3817; gas discharge in, (A) 3819; recovery, and electron capture, (A 3818; spike, theory, (A) 3815
Switching, capacitance r.f., (A) 2070
survey, 3433
system, broadcast programme, 2044
transients, caused by, theory, 3550
Symbols, graphical, for filters, 2094
Synchronization of oscillators, (A) 882
for television, 1488
Synchrotrons. (See also Cyclotrons; Electron accelerators); 439, 440, (D) 2036; electron orbits in, (A) 3787; orbit stability, 3440; racetrack, 3437

T

Telecommunication. (See also Communication, etc.)
century of, 3041, 3047
research at Marconi W/T Co., 3136
Telecontrol. (See also Control)
of aircraft, 1013, target, 1323, 1629; fog signals, (A) 1862; missiles, television for, 2738, 2739
Telegraphy. (See also Facsimile; Keying)
high-speed, and fading, 188
morse, recorder construction, 216
Teleron gas relay, 602
Telemetry. (See also Electronic devices); (B) 3192; aircraft system, 2238; electronic, in industry, 389; f.m. system, 136; fuel consumption, 1611; of measurements, 3343; plane-to-ground, 701; pressure measurement for atomic bomb, 3709; radio, (A) 1613; radiosonde equipment, 2280; with selsyn indicators, 1068; water level and pressure, 137
Telepathy and radio, 518
Telephony, amplifier for, 1473
century of, 3042
high fidelity, 236
interference from power systems, 3046
in mines, by ground transmission, (A) 1045
repeaters, submerged, (D) 540
Teleprinter regenerator, 2041
Television. (See also Pulses; Timebases)
broadcasting, in America, (A) 223, (A) 779
colour, 237, 451, 452, (D) 780, (A) 1708
apparatus, receivers, 2375; telechrome c.r. tube, 448; transmitters, (A) 1704, 2386; valves, 3116
demonstration, 1707
present position, 2363
review, 2364
on u.h.f., 2061
developments by Don Lee Broadcasting System, 464
field, 2371
use of films for, 3809
glossary of terms, 453
images, optical synthesis and evaluation, 1090
industrial standardization, (A) 1378
influence of radar, 3799
interference with, 3097, multipath, 783
post-war, 454, 455, 456, 457, 458, (D) 2367
principles, 2736
programming and production, (B) 785, 1713
proposed video standard, 2740
and radio, practical, (B) 2789
receiver sound channel, 231
recent developments, 222
reception, separation of sound and vision, 233
report, 224, 225, 228
scrambled, patent, 226
signal distortion in valve circuits, 3228
and society, 235
strato-television, 2370, 3090, 3801
survey, (B) 1097, (B) 2746
Television Society exhibition, 1945, 3093
at u.h.f., (A) 1704
waveform, B.B.C., 2368, 3089
—— **apparatus.** (See also Cathode-ray tubes; Receivers; Television, colour)
aerials, C.B.S., 2826
receiving, siting, 1384
amplifiers, i.f., 2534
line-scanning, 3086
wide band, 2857
cameras, French types, 3472
image orthicon, 1376, 1703, (A) 1704, 2371, 2374, 3085
slow-electron, Isoscope, 445
ultra-sensitive, 1376
circuits, synchronizing and separation, 1710
v.f. stage, 3803, 3804
video, functions, 782
c.r. tubes, projection type, 2405
kinescope, (A) 1704
portable pickups, 465, 3802
power supply, 2045, 2349
receivers, (A) 1649
alignment problems, 1089
deflection circuits, 2743
extended range, 463, 1093
interference by local-oscillator radiation, 2303
low noise, design, 3407
technical features, 3447
signal generator, 2255, 2646, 2980
survey, (A) 3445
sweep oscillator, 1381, 3220
synchronizing generators, 1488
test gear for, 380
transmitters and aerials, (A) 1448
various, (A) 2064, (A) 2059
—— **equipment** for guided missiles, 2738, 2739
mobile, 460
—— **projection,** large-screen, 232, 462, 1383
lens aberrations, 1379
moulded lenses for, 1095
problems, 461
resolution, theory, 1091
—— **studios,** design, 1706; equipment, (A) 1704; layout, 3426; lighting, 3083, 3084; technique, 229, (A) 781, 3087, (D) 3092
—— **systems,** characteristics, (A) 1704
Pye videosonic, 230, 459, 778, 1092, 2062, (A) 2366
sound on vision carrier, 1382, (A) 1704, 3091
transmission networks, 738, v.h.f. relay, 187
1015–line, 2741
Temperature, colour test for projector lamps, 2275
distribution, two-dimensional, in electrical apparatus, 202, 514
indication, compounds for, 2596
recorder, resistance, 3371
Terrain, profile drawing aids, 1067
Terrestrial magnetism. See Geomagnetism
Test equipment. (See also Oscillators, test; Radar; Servicing; Signal tracer; and individual subjects); (B) 1607
attenuation, for v.h.f. transmission lines, 982
for broadcast a.f. circuits, 2644
coil short-circuits, 2640
d.c./a.c. multimeter, 1601
dummy aerial for aircraft transmitters, 243
dynamotor, 2639
h.f. wobbulator, 1604
ignition, 2267
inductance bridge, 2636
for induction relays, necessary precautions, 2981
industrial, 120
intermodulation analyser circuit, (A) 1925
low temperature chamber, 3060
oscillators, alignment, for television, 386; 40–500 Mc/s, 2651
production, for small capacitances, 124
for screening, 1600
for Se photocells, 2035
transient analyser, 2647
for valves, 381, 3482
various, for amateur station, 2970
weathering of plastics and rubbers, 943
Testing. (See also Measurements; and individual subjects)
cable fault location, 3345
of electronic equipment for vibration, 2097
of machinery, by running noise, 18
of materials, use of magnetism, 3692; non-destructive, 1931
microwave radar, (A) 1911
of precision-lathe spindles, 3370
of throat microphones, 2121
Tetrodes, beam. See Beam tetrodes
Thermal conductivity of Bi at low temperatures, 2174
of dielectrics, 1818
—— **detectors,** 3687
Thermometric compounds, 2596
Thermostats, for piezoelectric crystals, 3070
tapered-thickness bimetal, 757, (D) 2331
theoretical analysis, 1689
Thickness measurement. (See also Micrometers)
paint, 2260
Thyratrons, applications, to industry, 2770; tuning indicator, 2348
circuits, pulse response, 1186
hydrogen, high-voltage, 3117
ionization and de-ionization time, 2069
in radio engineering, 2090
Timebases, calibration, 128
circuits, as frequency divider, 308, (A) 886, (A) 887, (D) 2093, 3826
linear, 2528
saw-tooth, 1381
single-sweep, 571, 885, (A) 2162
Time measurement with c.r.o., 664
explosion velocity, 2861
of moving body, 3661
photographic exposure, 3068, 3353
short intervals between counter discharges, 2626
very short, (A) 3662; 10^{-9} sec, (A) 3770
—— **signals,** broadcast, proposed, 1954
Timer circuits, 2832
Titanates, barium, as insulating materials, 3639
various, permittivities, 347
Tone control. (See also High fidelity)
circuits, 26, 541, 1760, 1761, 3170, 3728
three-band variable, 1170
—— **correction,** bass, 2532, and treble, 2533
—— **synthesis,** (A) 3512
Transceivers, portable, walkie talkie, 467; 2700 Mc/s, 3458
Transducers, electroacoustic, 264, 265; electromechanical, f.m., 1144

Transformers, capacitance of windings, 2493
coupling, design, 856
design, (B) 218
hipersil for, 952
i.f., for f.m. signals, 2831
for 455 kc/s and 8.3 Mc/s, 3430
mains, standard types, 1069
modulation for broadcast transmitters, 3766
multiple-winding, impedance, 2328
power and communication, high quality, 201
impedance, 1685, 2017
radio, design, construction and testing, 753
pulse, permalloy tape for, 2225
ratings and design methods, (A) 3551
telephone, magnetic screening, 3429
thermal characteristics, 2015, 3062
turns-ratio measurement, 203
water-cooled, 2016
wide-band, permalloy tape for, 2225
Transient response of carrier-frequency amplifiers, 68, 1196, 1474, 3205
of filters, 870
of tuned-circuit cascades, 3204
Transients. (See also Calculus, operational)
application of Thévenin's theorem, 37
calculation of, (B) 581
caused by switching operations, theory, 3550
delay network design, 1785
in ladder networks, 2836
tape recorder for, 217
Transmission, beam, 75-cm. 3415
formula, using effective area of aerial, 2282
multipath, f.m. distortion, 1041
Transmission lines. (See also Cables; Impedance)
aerials and wave guides, (B) 555
a.f. and r.f. phenomena in, 3176
attenuating, solution, 1173
balanced, characteristic impedance, 2817
for broadcasting systems, 281, 2139, (A) 3067, (A) 3180
charts, 548, input impedance, 2477
coaxial, beaded, 2132; history, 2131
double-stub matching, graphical calculation, 2479
effect of discontinuities, 1174
feeders for combined a.m. and f.m., 2138
field-plotting, 2814
as filters, 2480
formulae, 2475, 2476
h.f., (B) 292
high voltage, for carrier-current communication, 3417
as impedance transformers, 2820
nodal positions and s.w.r., 3175
resonant circuits, 2478
stubs, measurements and theory, 2133, 2134, (A) 3173
tanh and coth ($\alpha+j\beta$) charts, 549
tapered, 32
terminations, 1177
theory, (D) 31, 2471, 2472, 2473, 2474
transients in, theory, 550
as tuning elements, 63
vectorial treatment, 848
v.h.f., attenuation tester, 982
—— **systems,** coaxial cable, Unit Bay, 184, 2000, 3744
for f.m. and television, 738
microwave, power requirements, 482
waveguide, 2136, 2470
Transmitter-receivers. (See also Mobile communication)
amateur, 3098, 3405
handie-talkie, 1716, 3449
portable, 5300 Mc/s, 1100
Tiny Tim, 2063
420-450 Mc/s, 2678
2400 Mc/s, 2758
Transmitters. (See also Aircraft communication; Communication systems; Radar; Stations)
a.m., broadcast, 2747; design improvements, 2748
a.m./f.m., 2½ m, 788, 50 Mc/s, 468, 789
amateur band, 786, 2749, 3.5 and 7 Mc/s, 2754, 3 – 30 Mc/s, 1719, 2 m, 2378, u.h.f., 3459
v.f.o. for, 1720
broadcast, design survey, 3450; Monobloc, 3455, 3806; 20 kW, 2061
Canadian short-wave, 3106
conversion from 112 to 144 Mc/s, 469
crystal-controlled, 2 m, 3457
for d.f. calibration, 337
f.m., 3452; frequency control in, 3105; using phase modulation, 2766; 88 – 108 Mc/s, 1387, 1722, 2064
h.f., using lighthouse valve, 473
medium and short wave 10 kW, transportable, 3451
miniature 'phone, 3454
mobile, 28 and 50 Mc/s, 2755
multichannel, ground-to-aircraft, 2752
portable, 420 Mc/s, 2757
remote control, 1099, 2353
vacuum contained, 1403
various, for merchant navy, 18 – 820 m, 3305
3 – 14 Mc/s, 60 W, 2060; 3.5 – 28 Mc/s, exciter unit, 1718; 28 Mc/s low power, 1721, 2377; 28 – 54 Mc/s using dual-beam tetrode, 1388; 144 Mc/s, circuits, 1723; 150 Mc/s, crystal-controlled, 2756; 1000 Mc/s, 25 W, 2065
Triodes, high-power, for colour television, 3116
microwave, dimensional analysis, 3821; uses, (A) 1730
miniature, 6K4, circuits for, 2149
for 600 Mc/s, (A) 1730
'Tron' glossary, 1393
Tropicalization. (See also Corrosion; Humidity)
B.S.I. recommendations, 520
glues, 2946
of military equipment, 519
for moisture and fungi, 1876, 3502
tropic-proof components in Malaya, 426
Tropics. (See also Tropicalization and cross references)
performance of plastics, 349
testing of insulating materials for corrosion, 256
Troposphere. See Atmosphere
Tuner, t.r.f., high fidelity, 1982
Tungsten, thoriated, ion emission from, (A) 3466
Tuning, automatic remote, for transmitter, 1099
indicator, visual, using thyratron, 2348
permeability. See Permeability tuning
push-button, 772
remote control for receivers, 1340
system, for receiver, 2297

U

Ultra-high-frequency. (See also Absorption, microwave; Aerials; Circuits; Triodes)
mathematics of, (B) 1280
—— **generation.** (See also Klystrons; Magnetrons)
Al particles in oil-stream, 589
c.w. power, (A) 1715
oscillators for, (A) 2083
using spark oscillator, 1101
—— **technique.** (See also Magnetrons): 185, (B) 1143, (B) 3156
a.m. for range increase, 2326, (A) 3424
developments, 3361, survey, 3364
measurements, 1914, 2645
frequency, 679, 1295, (A) 1923, 3378, 3679
impedance, 677, 977, 1916
power, (A) 1576
survey, 1914, (A) 2963
optical detection, (A) 3499
paraboloidal reflectors, 1909
pulse spectrum analyser, (A) 1576
Ultrasonics. See Supersonics
Units, absolute bels, 2436
m.k.s., 3493
and standards, N.P.L. discussion, 3341
Uranium glass, luminescence, 2207

V

Vacuum technique. (See also Manometers; Pumps; Scaling); (B) 854
control of gas pressure, 3300
demountable seal, 934
diffusion pump oils, 630
gauges, and control system, 2203
ionization, 2204, linear response, 3616, regulator, 2589
Pirani, for 15 mm Hg, 1552
radium type, 1867
thermocouple, 2919
leak tester, 936, 1550, 1551
metal valve, 1258
multiple high-vacuum valve, 3299
seal bushing, 1074
stirrer, 2590
vacuum switch, (A) 2021
valve, (A) 2206
Valve amplifiers. See Amplifiers, valve
—— **circuits.** (See also Circuit theory; Equivalent circuits)
electrometer triode, fluctuations in, 2833
signal distortion in, 901
—— **oscillators.** See Oscillators
Valves. (See also Beam tetrodes; Diodes; Equivalent circuits; Gas discharge tubes; Magnetrons; Noise; Resnatrons; Signal/noise ratio; Space charge; Switches t.r.; Thyratrons; Triodes)
amplifier, calculation of characteristics, 2406, (A) 3484
cold-emission kenotrons, (A) 2387
colour code for, 246, 484
current to positive grid, theory, 2087
early, 489, 2088, history, 245
effect of surface charge, (A) 2388
electrometer, double-tetrode, 3823
factors determining life, 1397
focusing of cathode emission by grid-support wires, 3112
gas-filled relay, teleion, (A) 802
glossary of 'trons', 1393
grids, electrostatic properties, (A) 2397, primary emission, 1596
h.f. currents in, (A) 2389
high-power, for v.h.f., 3115
industry, postwar, 248
I.R.E. papers, (A) 2078
list of electrical equivalents, 798
manufacture, use of fine wires, 1564
glass problems, (A) 1730
induction heating in, 1615
miniature for f.m. conversion, (A) 1730
glass for, (A) 1565
multi-electrode, theory of electron current, 1109
with nonlinear characteristics, intermodulation products, 2852
oscillograms of characteristics, 2395
for proximity fuses, (A) 1398
recent developments, 247, for radar, 2778
small, Brown Boveri, construction, 3476
standardization, 3110
suggested symbols, 3111
test panel improvement, 3356
tester for, 381
theory and applications, (B) 252
transmitting, continuously evacuated, 1110, 3482
manufacturing technique, 490, 1110, 3481, 3482
triode-connected tetrodes and pentodes, 2086
u.h.f. German, 1399
Vade Mecum, comprehensive list of European and U.S. types, (B) 3115
velocity modulated, 2392
e.s. focusing in, (C) 3475
using secondary-emission, (A) 1400
Varnishes, insulating, 352, quality control of, 101
Vector analysis, 655
Velocity modulation. See Modulation, velocity
Vibrations. (See also Crystals; Oscillations; Piezoelectric crystals; Quartz crystals)
analysis, 3142
control for aircraft radio, 2434
detection, wave analyser for, 2965
elastic, equations for, 312
f.m. circuit for calibration or monitoring, 1144
free-edge disk in baffle or horn, (A) 3512
fundamental frequency of wood plates, 1145, (D) 3158
insulation, of electronic products, 95; and structural rubber, 96
mechanical, standard, 522
testing of mobile equipment, 2097

Vibrators, conductor, current distribution in, 2825
non-synchronous, design, 754
power, rectifying and non-rectifying, 3431
spherical, equivalent circuit, 3160

Visible speech, 823, (A) 1150, 1425
use of c.r. tube, 3520
phonetic principles, 3518
use of phosphors, 3519
portrayal, 3516
spectrograph, 3517

Voltage dropping in a.c./d.c. receivers, 3037
fluctuation. See Fluctuation
measurement. (See also Voltmeters)
impulse, 365, (AD) 967, 2624, (A) 2964
regulation, with gas filled valves, design data, 801
regulators, a.c., for mains, 1365
electronic, (A) 2014
for X-ray circuits, (A) 1367
stabilization, electronic means, 756
stabilizers, for d.c. supply, 3069
nonlinear bridge, 867, 2494

Voltmeters. (See also Voltage measurement)
a.c., zero-suppressed, 675
for complex waveforms, 377
d.c., high-resistance, 1590
electrostatic, for small e.m.fs., 3352
h.f., 1601
integrating, 1587
loading, correction formula, 2632
mega-, for electron accelerator, 3672
peak, for sparking plug voltages, 3675; suppressed-range, 3683
pulse, 121, 376
valve, d.c. to a.c. conversion, 1922
diode, 1589, pulse response, 1283
early, 2971
inverse, 3673
range 0 - 6000 V, 375
r.f. probe for, 1591
with stable zero adjustment, 976
survey, 3674

Volume compressors, distortion in, 274
—— **expanders,** gain-controlled, 580
surgeless, 3226
—— **expansion,** (A) 304

W

Wattmeters, electronic, 680; hypso-, 3681
Wave analyser, for vibration detection, 2965
Waveform analysis. (See also Fourier analysis); (B) 986; using c.r. tube, 972, 1917, 2244, 2966; graphical, 102
circuits, square-wave, 3219
complex, l.f. oscillator for, 3217
television, B.B.C. standard, 2368, equations chart, 2359
Waveguides. (See also Cavity resonators; Wave propagation, electromagnetic)
aerials and transmission lines, (B) 555
application of impedance concept, 3178
attenuation in, anomalous, 2818, 3540; minimum, 1175
branched, propagation in, 849
circular, scattering in, (A) 3542
curved, propagation in, 2469
cylindrical, radiation from end, 2468
diffraction and reflection in, 3172
use of equivalent circuits, (A) 1448
flexible, 3543
partition with narrow resonant slit, (A) 3541
probe error in standing-wave detector, 981
rectangular, right-angled junctions in, 2134, (A) 3173
survey, 284, 546, 1447, 3174
systems, 2136, 2470
terminations using metallic films, 1795
theory, 30, (A) 2135
valleys acting as, 3394
Wave mechanics, elementary theory, (B) 1234
representation of electric field in, 903
Wavemeters, cavity-resonator, 1596, 1924
microwave, 1595, 155 – 255 Mc/s, 3680
Wave propagation. (See also Acoustics)
longitudinal and transverse, in soil, 2189
sound. See Sound propagation
supersonic, velocity in water, 2449
—— **electromagnetic.** (See also Coastal refraction; Field strength; Ionosphere; Radiation; Waveguides)
and aerials, (B) 859
in cables, velocity measurement, 2977
curved earth geometrical optics, 1637
diffraction round earth, 160
along earth, 3012, effective path, 3011, theory, 3009, uneven, 1962, 3010
influence of ionized gases, 3246
in inhomogeneous medium, (A) 2283
ionospheric, conditions in Feb. 1946, 1965, forecasting of, 3721
forecasts for April, 1965, May, 2674, June, 2675, July, 3016
and gliding waves, 710
and loran, 2190
new theory, 710
scattering from great virtual distances, 597
sporadic-E, 2286
and sunspots, 1025, 1235, 2284, of Feb. 1946, 3015
survey, 709
theory, 3720
and tropospheric, conference, 1331
multipath, effect on f.m. reception, 2321
polarization in dipole field, (A) 1330
reflection from atmospheric irregularities, 1640
short-wave fading, 2290
along single wire, 3006
sky-wave, during war, (A) 1636
tests on 45.5 and 91 Mc/s, 1028, (A) 1334, (D) 1335
ultra-short, effect of ground and water, 2673
effect of rain, (A) 1696, 1972, 1973
effect of tropospheric refraction, 403
f.m. for, 402, 1971
over hills, on 144 Mc/s, 1642
measurements on, 803
and meteorology, 3013
survey, 3017
various aspects, (A) 1636
valleys acting as waveguides, 3394
in waveguides, (B) 2491
1.5 – 30 Mc/s, NBS-ARRL projects, 1970
Waves, annotated bibliography, (B) 713
elastic, diffraction, 1906
reflection and refraction, 2862, 2864
electromagnetic, ultra-short, characteristics, generation, survey, 3264
velocity measurement, 1638
sea, measurement, 2265
Weather forecasting. See Meteorology
Weatherometer, for plastics and rubbers, 943
Welding, of fine thermocouple wires, 1888
of platinum electrodes, 2612
spot, of aluminium, 1889, contact resistance, 1890, of thin wires, 954
Wheatstone bridge, theory, 1593
Wilson chamber, magnetic field for, 2720
Wind measurements, upper air, 919
Wire, fine, use in valves, 1564
formex, insulation removal, 2930
insulated, survey, 2604
rubber-insulated, h.v. testing, 3068
stranded, splice detector, 140
Wiring, in microwave circuits, (A) 1448
Wobbulator, 2643
Wood, resin-treated, resistivity, 1269

X

X-ray applications, (B) 3716
in industry, 196, 1305, metal, Prague conference, 1953, radio, 1623, and science, 1304
for production control, 2 MV equipment, 1622
study of crystal surfaces, 2611
study of oxide cathodes, 3811
—— **filters,** secondary radiation from, 3595
—— **tubes,** current and voltage stabilization, 2330
developments, 770
in industry, properties, 769
manufacture, 215
with rotating anode, Rotalix, 3075
X rays. (See also Radiology)
effect on piezoelectric crystals, 126
history and development, 199, 1371, early A.I.E.E. papers, 1225, early experiments, 1303, progress in Europe, 1372

ERRATA

In "Abstracts and References" throughout the year

Abstract No.	804	E. N. Ferrell *should read* E. B. Ferrell
,, ,,	1534	G. A. Wert *should read* C. A. Wert
,, ,,	1797	Reference to 884 *should read* 883
,, ,,	1962	*Add* For Parts I and II see 2529 of 1945
,, ,,	2117	Love *should read* Loye
,, ,,	2349	Part 13 *should read* Part 14
,, ,,	2427	*Insert author* "A. Mateur"
,, ,,	2488	W. V. B. Roberts *should read* W. van B. Roberts
,, ,,	2544	Hysteresis *should read* Magnetic After-effect
,, ,,	2931	*Insert author* A. E. L. Jervis
January Abstracts		Trans. (mon) Amer. Inst. elect. Engrs *should read* Trans. Amer. Inst. elect. Engrs
October ,,		Physica Eindhoven *should read* Physica's Grav

Section II—1947

Index to

Abstracts and References

This section contains an index, listed separately by author and by subject, for all Abstracts and References published in Proceedings of the IRE from February, 1947, through January, 1948.

AUTHOR INDEX

AUTHOR INDEX—A name followed by "and" is that of the first author of a jointly written paper, while the word "with" indicates that the name indexed is that of the second author.

A

Ab, E. A., cathodoluminescence, **2063**
Abadie, P., dispersion and absorption of liquids for cm λ, **2730**
—— E. Vassy and Mme. É. Vassy, altitude of emission of night sky light, **2119**
Abbott, T. A., with others, mass spectrometer for leak detection, **2441**
Abele, M., calculation of cavity resonators, **3823**
Abraham, L. G., and H. I. Romnes, television networks, **3317**
Ackerman, S. L., and G. Rappaport, radio control systems for guided missiles, **1172**
Adams, A. E., and D. Waloff, torque motor, **247**
Adams, E. Q., with others, current transients measurement in l.v. circuit, **1845**
Adams, P. R., and R. I. Colin, long range radio navigation system. Navaglobe, **(A) 1089, 3140**, operating conditions for, **1086**
—— with others, Navaglobe, Navar, Navaglide and Navascreen, **1092**
Adcock, F., and C. Clarke, thunderstorm location by d.f., **(A) 2126, 2779, (A) 3525**
Addison, E. B., radar countermeasures, **2790**
Adkins, B., amplidyne regulating systems, **(A) 4039**
Adler, H. A., and K. W. Miller, probability problems in electrical engineering, **465, (D) 3173**
Adler, R., electromechanical filter, **3075** ; phasitron f.m. system, **2239**
Affanasiev, K. J., mutual effects in half-wave dipole arrays, **23, (C) 1011, 2013**
Aharoni, J., Antennae—Introduction to Their Theory, **(B) 2338**
Aiken, C. B., W. H. Carter, Jr, and F. S. Phillips, rapid-response bolometers, **1730**
Aiken, H. H., and G. M. Hopper, automatic sequence controlled calculator, **461, 787**
Ailleret, P., harnessing wind energy, **1286**
Aisberg, E., effect on receiver design of characteristics of transmitters, **2911** ; French terms of English origin, **1280** ; frequency spectrum analysis, **477** ; radio beacon, and loran, **1090** ; r.f. spectrum analyser, **1504**
Aitchison, R. E., Geiger counter for determining Th content of Th-W wire, **751, 820**
Akeley, E. S., resonant cavities and application to electron accelerators, **1708**
—— with others, Purdue microwave electron accelerator, **(A) 1540**
Albers, V. M., with F. S. Replogle, Jr, 4-channel electronic switch, **3445**
Alder, F., and others, counter tubes with alcohol vapour, **2748**
—— with others, rapid counter tubes, ion velocity, **2867**, pulse shape, **2868**
Alexander, L. G., equal-ratio impedance bridge, **806**
Alexandrian, A., with A. Alichanian, types of cosmic-ray showers, **1764**
Alford, A., long-slot aerials, **(A) 1004, 3034**
—— and others, aircraft u.h.f. course indicator, **1094**
Alfvén, H., changes in cosmic-ray intensity and geomagnetic storms, **721**
—— and S. Eklund, h.v. measurement, **1859**
Alger, P. L., quality control in engineering, **2301**
—— and others, progress in engineering knowledge in 1946, **2296**
Alichanian, A., and A. Alexandrian, types of cosmic-ray showers, **1764**
—— and A. Weissenberg, cosmic rays at 3 km height, **1763**
—— and others, cosmic rays at 3 km height, **1423**
Alichanow, A. See Alikhanov, A. I.
Alikhanov, A. I., cosmic rays at 3250 m height, **1443**
—— with others, cosmic rays at 3 km height, **1423**
Allen, E. W., Jr, v.h.f. and u.h.f. signal ranges, and interference, **2213**
Allen, T. P., electronic engineering, **(A) 3372**
Allibone, T. E., atoms, electrons and the engineer, **3367**
Allwood, H. I. S., J. G. Bartlett and G. T. Davies, zero error of range in radar equipment, **1806**
Alper, T., fluorescence fatigue, **432**
Al'pert, Ya. L., and A. A. Einberg, ionosphere recombination coefficient, **3109**
—— and B. N. Gorozhankin, radio observations in solar eclipse of 9th July 1945, results, **2093**
Alred, R. V., switched-beam directive aerial on 600 Mc/s, **1681**
Altar, W., *Q* circles for analysis of resonant microwave systems, **2360, 2711**
—— and J. W. Coltman, microwave impedance plotting device, **3571**
Altman, F., and J. H. Dyer, pulse-time multiplex broadcasting, **3657**
Altovsky, V. A., multiplex u.h.f. telecommunication systems, **1587**
American Institute of Electrical Engineers, sign of reactive power, **971** ; statistical methods in quality control, **968**
American Radio Relay League, Radio Amateur's Handbook, 1946 Edition, **(B) 1303**, 1947 Edition, **(B) 3585**
Amirhanov, H. I., thermal energy of rectification, **2143**
Amos, S. W., a.v.c. calculations, **1722** ; receiver aerial couplings for medium wavelengths, **2010**
Andersen, W. M. A., with others, supersonic power output of quartz crystal, **2442**
Anderson, C. D., cosmic-ray effects at high altitudes, **(A) 1424**
Anderson, L. J., and others, cm-wave attenuation in rain, **(A) 1181, 2563**
—— with D. W. Martin, headphone measurements and performance, **1991**
Andrade, E. N. da C., and C. Dodd, effect of electric field on viscosity of liquids, **391**
Andrews, B. A., supersonic garage-door opener, **2312**
Andrews, D. H., and C. W. Clark, r.f. detection by superconductivity, **1915, (A) 3853**
—— R. M. Milton and W. DeSorbo, superconducting bolometer for infra-red detection, **1527**
Andrianoff, A. M., emission from oxide cathode, **573**
Angel, Y., television throughout France, **2588**
Angwin, A. S., telecommunications in war, **(A) 4094**
Anhorn, V. J., with W. E. Barr, scientific glass blowing and laboratory techniques, **461**
Anker, H. S., stabilized d.c. amplier, **3482**
Anon.
  A.A.McK., electronic applications at Caterpillar Tractor works, **2197** ; radio despatching of taxicabs, **2579**
  A.Ch., radio communications in Switzerland, **4098**
  A.H., emission spectra of night sky and aurorae, **3904**
  A.K.W., charts for parallel standard resistors, **680**
  A.L.B., Moscow telecommunications conference, **871**
  "**A Visitor**", components exhibition, Paris, **2378**
  A.Z., photovision, **4022**
  B.G., postwar receivers, RME 45, **224**
  D.G.F., f.m.–a.m. receiver design, **4011** ; television receivers, **(A) 3688**
  "**First Year Lecturer**", definitions of Ohm's law, **(D) 2388**
  F.B., f.m. cyclotron, **2526** ; [illegible] equipment, **1724** ; television c.r. tubes, **2629** ; travelling-wave valve, **938**
  G.G., impedance matching with aerial tuner, **14** ; narrow band f.m. amateur reception, **2220**
  G.W.O.H., Alexander Graham Bell, life and work, **2845** ; comparison of a.m. and f.m., **(D) 3661** ; electric-magnetic analogy, **(D) 3364** ; experimental basis of electromagnetism, **(D) 3662** ; mechanism of magnetic attraction, **3860** ; permeability of dust cores, **35, 1692** ; relative directions of electric and magnetic vectors, **(D) 3364** ; stresses in magnetic and electric fields, **396** ; use of analogies, **970** ; use of standard terms and symbols, **1970** ; valve equivalent circuits, **(D) 2623** ; vicalloy, for permanent magnets, **3554**
  H.W.N., sunspots in 1947, **3107**
  J.H.J., new B.B.C. station techniques, **880** ; supersonic flaw detector, **986**
  J.V., vibrotron, **2624**
  K.B.W., frequency allocation in 10-m band, **872**
  "**Kilovar**", electronic devices in power supply, **487**
  M.J.A., h.f. beating, **828**
  N.J.K., l.f. variation of power loss in glass, **1113**
  "**One out of Many**", receiver production in Holland during occupation, **2225**
  P.B.J., service frequency allocations, **881**
  "**Radionyme**", mechanism of magnetron, **590**
  "**Recorder II**", flaw detection in copper, **437** ; soft soldering, **[illegible]**
  R.H.O., Cs vapour lamp for infra-red communication, **1204**
  R.M.S., transmitter, type BC-375-E, **980**
  W.MacD., stamped wiring, **3488**
Anthony, R. L., with others, electrical conductivity of rubbers with carbon black, **3557**
Antonov-Romanovski, V. V., mechanism of luminescence, of alkali-halogen phosphors, **1817**, of phosphors, **2136**
Apker, L., E. Taft and J. Dickey, crystal networks, **(A) 3450**
Appell, F., silicones, preparation, properties and uses, **1107**
Appleton, E. V., discussion on the ionosphere, **(D) 3120** ; extra-tropospheric influences on u.s.w. propagation, **402** ; research in industry, **(A) 397** ; scientist in war time, **965**
—— and W. J. G. Beynon, ionospheric data and radio communication, **2885**
—— and J. S. Hey, solar radio noise, **3506**, circular polarization of, **86**
—— and R. Naismith, radio detection of meteor trails, etc., **1752, 3874**
Apthorpe, F. G., synchrodyne receiver, **(D) 3638**
Aram, N. W., with others, 45.5 and 91 Mc/s field-strength measurements, **2214**
Aranovich, R. M., electronic apparatus with secondary emission, **572**
Arkadiev, D. I., gaseous nature of non-conducting layer in Se photo-cells, **2282** ; rectifier and inner photoeffect in Se, **(A) 1828**
Arkadiev, V., magnetic spectra, **2454**
Arley, N., proton hypothesis of cosmic rays, **2107**
Armstrong, R. B., with G. L. Grisdale, communication receiver design, **223, (A) 1189**
Arnold, A. H. M., inductance of wires and tubes, **1017, (A) 3041**
Arnold, O. M., with others, supplementary bibliography of electron microscopy, **1546**
Artsimovich, L. A., electron-optical properties of emission systems, **568**
—— and I. Pomeranchuk, radiation of fast electrons in magnetic field, **2732**
von Arx, A., and W. Bantle, inverse piezoelectric effect of KH_2PO_4, **2449**
Arzimovich, L. See Artsimovich, L. A.
Aschen, R., h.f. generator, *Q* meter, frequency analyser, **1850** ; principal faults in television receivers, **1608** ; RC l.f. generators, **1039** ; television projection systems, **4053**
—— and R. Gondry, Principes de l'Oscillographe Cathodique, **(B) [illegible]**
—— and M. Lafargue, h.f. beat-frequency oscillator, **2358, 3827**
Aschenbrenner, R., f.m. and a.m., **1566** ; 60–15 m communication receiver, **1190**
Ashdown, G., waveguide coupler, **3422** ; waveguide measurements, **173**
Ashkin, A., rising-sun magnetron, **(A) 288**
Ashmead, J., and A. B. Pippard, spherical reflectors as microwave scanning aerials, **1342**
—— with A. Maclese, rhumbatron waveguide switch, **1325, (A) 1672**
Ashworth, F., W. Needham and R. W. Sillars, SiC non-ohmic resistors, **141, (D) 1115**
Askew, J. D., contemporary receiving valves, **4089**
Aspin, J. J. E., picture transmission, **(A) 3878**
Atchley, D. W., Jr, and R. E. Fricks, direct-reading modulation meter, **1854**
Atiya, F. S., Doppler effect in propagation, **(D) 4068**
Atkinson, R. L., 153-Mc/s f.m. system for forestry service, **4087**
Atwood, N. A., prediction of amateur propagation conditions, **2898, 3253**
Aubert, R., ionospheric propagation and s.w. link calculations, **1210, (D) 3654**
Audet, H. A., f.m. band converters, **225**
Austen, A. E. W., and H. Pelzer, electric strength of paraffins and polymers, **764**
—— with others, voltage characteristics of polythene cables, **3178, (A) 3959**
Austin, S. C., police communications in Australia, survey, **2246**
Autler, S. H., with G. E. Becker, water vapour absorption of cm waves, **1562**
Avins, J., with S. W. Seeley, ratio detector, **3643**
Ayliffe, S. H., processes for alteration of ship's magnetization, **843**
Azimov, S. A., and others, cosmic ray intensity, measurement, **3883**, at 3860 m and 5000 m, **3884**

B

Babat, G. I., electrodeless discharges, **2019**
Babcock, H. W., magnetic fields of astronomical bodies, **3891**
Babkes, J. J., phase-modulation circuit for f.m., **931**
Bach, J. L., X-ray inspection equipment, **1548**
Bacon, G. E., beam aerial systems for 1½ m, **1356**
—— and J. C. Duckworth, λ variation in waveguides, **1321, (A) 1670**
v. Baeyer, H. J., microwave radiotelephony transmission, **1929** ; multichannel modulated pulse transmission, **2235**
Bailey, C. E. G., slot feeders and slot aerials, **1336**
Bailey, F. M., and H. P. Thomas, phasitron f.m. transmitter, **277**
Bailey, J., annealing of styrene and related resins, **455**
Bailey, R. H., 4-band radio compass, **3128**
Baird, H. F., magnetic elements, Christchurch, N.Z., 1945, **3894**
Baird, W. G., Jr, with D. T. Ferrier, kytoon for erecting aerials, **27**
Baker, E. B., A. J. Barry and M. J. Hunter, dielectric constant of silicones, **761**
—— with others, dielectric properties of polymers, **(A) 3170**
Baker, G. J., dimensions and units of e.m. quantities, **1733**
Baker, G. T., bridge method for nonlinear resistors, **2501**
Bakker, C. J., radio investigation of ionosphere, **3519**
Balachowsky, —, e.s. field plotting with adapted electrode, **1495**
Baldinger, E., with others, counter tubes with alcohol vapour, **2749** ; rapid counter tubes, ion velocity, **2867**, pulse shape, **2868**
Baldock, G. R., and W. Grey Walter, electronic l.f. analyser, **794**
Baldwin, G. C., G. S. Klaiber and A. J. Hartzler, synchronization of auxiliary apparatus with betatron, **3609**
—— with E. E. Charlton, betatron accelerator in nuclear physics, **(A) 1154** ; 100-MeV betatron, **(A) 1154, 3233**
Ballard, R. J., and J. L. Boyer, ignitron converters, **(A) 1154, 3222**
Baller, H., with F. Iannone, gas valve coupling for d.c. amplifiers, **60**
Ballerini, L., with F. Scandone, optical properties of thin metallic laminae, **[illegible]**
Balsbaugh, J. C., with P. Godley, metallized capacitor tests, **3175**
Balthis, D. L., Westinghouse colour television studio equipment, **(A) 236, 3307**
Band, W., diamagnetism and superconductivity of electron assembly, **71**
Banerjea, B. K., wave propagation in atmosphere, **3626**
Banerjee, A., with others, h.f. and m.f. properties of Indian soils, **1900**
Banerjee, S. S., and G. C. Mukerjee, s.w. fading on 700 km path, **853**
Banos, A., Jr, equivalent circuit of cavity resonator, **(A) 1086**
Bantle, W., specific heat of Rochelle-type substances, dielectric measurements on KD_2PO_4 crystals, **2448**
—— and W. Lüdy, elastic behaviour of Rochelle-type substances, **2446**
—— with A. von Arx, inverse piezoelectric effect of KH_2PO_4, **2449**
Banwell, C. J., common aerial for radar transmission and reception, **1340**
—— with A. C. B. Lovell, solar radiation on 72 Mc/s, **406**
Barat, M., Jr, with P. V. Trice, superregenerative frequency converter, **2889**
Barber, N. F., narrow band-pass filter using modulation, **2697**
—— and others, frequency analysis of ocean waves, **203**
Barbier, D., night sky spectrum, analysis, **2097**, measurements, **2424**
Bardeen, J., rectification at metal-semiconductor contact, **3086**
Bardell, P. R., permeability of dust cores, **1693, (D) 3938**
Barducci, I., experiments on artificial ears, **3769**
Barkla, H. M., lower Curie point of ferroelectric salts, **128**
Barnes, B. T., E. Q. Adams and D. D. Hinman, current transients measurement in l.v. circuit, **1845**
Barnes, C. E., radar for carrier-based planes, **111**
Barnes, C. C., current rating of cables in ducts, **13**
Barnes, D. E., with F. K. Goward, synchrotron for electron acceleration, **834**
Barnett, G. F., and A. L. Free, photoelectric dust-meter, **1536**
Barr, W. E., and V. J. Anhorn, scientific glass blowing and laboratory techniques, **461**
Barret, G., iconoscope and isoscope for large screen television, **1243**
Barrett, R. E., and M. M. Goodman, simplified television system, **3683**
Barrett, R. L., with C. S. Smith, chemical identification by X-ray diffraction, **2884**
Barron, S. L., development of British scientific instruments, **(A) 315**
Barry, A. J., with others, dielectric constant of silicones, **761**
Barstow, J. M., rural carrier telephone system, **(A) 3271**
Bartelink, E. H. B., and others, rural carrier telephone system, **(A) 3271**
Bartels, J., international magnetic character figures C for 1884–1889, **3113**
Barthélemy, R., definition in television, **1237** ; iconoscope, theory, **917, 2583** ; isoscope, **1244** ; reduction of noise in television analysers, **[illegible]**
Barthon, J., television detector and video amplifier stages, **4058**
Bartlett, J. G., with others, c.r. tube problems in Service radar applications, **2984** ; zero error of range in radar equipment, **1806**
Bartlett, N. R., punched-card technique for statistical calculations, **788**
Barton, M. A., travelling-wave valve, **586**
Barton, R. W., with W. T. Perkins, Radio Communications, **(B) 325**
Barton, V. P., relativistic misconception, **(D) 685**
Barwick, E. C., amplidyne control system, **2944**
Barzilai, G., with G. Latmiral, u.s.w. propagation, **4086**
Basden, W. W., five-element rotary aerial, **645**
Batcher, R. R., electronic process control, **2522** ; television, recent advances, **566**, reception, test equipment, **1517**, synchronizing signal generating units, **1517, 2507** ; valve circuits for control, **2521**
—— and W. Moulic, Electronic Control Handbook, **(B) 2543**
—— and others, Electronic Engineering Handbook, **(B) 2544**
Bateman, R., elimination of u.h.f. interference fading, **229**
—— A. G. McNish and V. C. Pineo, radio observations on meteors, 9th Oct. 1946, **864**
Bates, D. R., equilibrium of atmospheric sodium, **3126** ; night sky light, **(A) 3127**
—— and H. S. W. Massey, basic reactions in upper atmosphere, **414**
Bath, C. C., with H. Goldberg, multiplex with pulse-time and pulsed f.m., **(A) 3278**
Batsel, C. N., radio heating in textile industry, **491**
Baudot, J., matrix form of Maxwell's equations, **2475, 3491**
Bauer, B. B., measurement of impedance of pickups, **3400**
Bauer, E., and D. Massignon, theory of crystalline field in solid and liquid polar dielectrics, **2736**
Baum, R. F., broad band i.f. amplifier, **678** ; directive broad-band aerials, **1356**
Baum, W. A., and others, ultraviolet solar spectrum up to 88 km height, **1421**
Baumann, H. C., 30-kV power supply, **257**
Baumgartner, H., European wartime broadcast receivers, **1870** ; h.f. heating applications, **1879**
Baxandall, P. J., hum in high-gain a.f. amplifiers, **1669**
Baxter, H. W., valve voltmeter, **1141**
Bay, Z., radio reflection from moon at 120 Mc/s, **2232**
Beach, R., electrostatic ills and cures of aircraft, **2916**
Beam, R. E. (Ed.), Proceedings of the Second National Electronics Conference, **(B) 3381**
Beard, E. G., Manual of Radio Practice for Servicemen, **(B) 2393**
Beatty, W. A., pulse modulation terminology, **237**
Beaujard, L., with P. Lacombe, X-ray crystallography, **753**
Beck, A. H., cavity resonators and electron beams, **(D) 3824**
Beck, H. M., with W. R. Faust, *n*-stage amplifier oscillation conditions, **677**
Becker, G. E., and S. H. Autler, water vapour absorption of cm waves, **1562**
Becker, J. A., C. B. Green and G. L. Pearson, properties and uses of thermistors, **765, 3552**
Beckwith, J., a.m. by carrier phase shift, **539**
Bedeau, F., Nikola Tesla, **2999**
Beebe, R. D., with N. M. Best, television aerials, close-spaced arrays, **3799**
Beeching, G. H., precision fire control radar, **1803**
Beers, N. R., with others, Handbook of Meteorology, **(B) 1064**
Beese, M. C., infra red communication, **(A) 3650**
Beese, N. C., Cs vapour lamps, **3596**
Begun, S. J., magnetic recording, developments, **1994**, equipment design, **(A) 2307**
Behling, H., *n*-coupled oscillatory circuits, analysis, **880**
Bein, A., crystal diode probe for signal tracing, **2506**
Beitman, M. N., Most-Often-Needed 1946 Radio Diagrams, **(B) 1058**
Belenky, S., ionization bursts created by mesons, **1767**
—— with I. Tamm, energy spectrum of cascade electrons, **1428**
Belevitch, V., extension of Norton's method of impedance transformation, **3818** ; transient response of filters, **(D) 2035**
Bell, D. A., comparison of a.m. and f.m., **(D) 4030** ; dipole with unbalanced feeder, **648** ; economics of radio industry, **1293** ; nature of rotation, **390** ; reflections in television transmission, **653, (A) 1236**
Bell, L., N. Birger and V. Veksler, penetrating cosmic ray showers at 3860 m height, **1441**
Bell, P. R., S. DeBenedetti and J. E. Francis, Jr, fast coincidence circuit with pulse height selection, **(A) 3805**
Bell, R. L., linearity range of noise-measuring amplifiers, **2718**
Belus, R., P. Herreng and J. Ville, impedance deviations in cable sections, **3779**
Bénard, J., and P. Lacombe, surface hardening of crystals by polishing, **769**
Benedetto, F. A., mean life and production levels of mesons, **2101**

Benham, W. E., diode, emission-limited, **1266**, equivalent, **1966**
Benin, Z., permeability-tuned amplifier with special coil design, (A) **1026**, **3070**
Bennett, G. M., communication equipment, in H.M.S. Boxer, **240**, in H.M.S. Vanguard, **2577**, naval, **1940**; radar for U-boat detection, **739**
Bennett, W. H., cold-cathode rectifier, **3706**
Bennett, W. R., biased ideal rectifier, **3506**
Bennington, T. W., ionosphere and sunspots, survey, **2117**; ionospheric forecasts, s.w., **221**, validity, **1906**; whistling meteors, (D) **3875**
Benoit, J., improved methods for voltage stabilization, **1585**
Benson, B. B., design of proportional counter for γ rays, **1522**
Benson, G. C., with others, effect of adsorption on activated carbon, **2083**
Bentley, L. C., with S. S. West, electronic millisecond timer, **3568**
Benzer, S., Ge-Ge contacts, (A) **2467**
Beranek, L. L., acoustical properties of sound absorbing materials, **3763**; measurement of acoustic impedance, **3402**
Berestetski, V., e.m. field of multipoles, **3863**; space correlation of particles in cosmic rays, **1435**, **1766**
Bergeron, M., with C. Cardot, radio stations near Toulouse, **527**
Bergmann, P. G., reflection of sound from rough surfaces, (A) **2307**; wave propagation in inhomogeneous medium, **847**
Beringer, R., with R. H. Dicke, microwave radiation from sun and moon, **3103**
—— with others, cavity accelerator for electrons, **3899**; microwave absorption, atmospheric, **1843**, in water vapour, (A) **219**
Berkley, C., with R. Feldt, c.r. spectrograph, (A) **1154**, **3219**
Berkner, L. V., naval airborne radar, **169**
Berlovich, E., misses in G-M counters, formula, **1873**, theory, **1872**
Berman, L. M., direct-reading frequency meter, to 100 Mc/s, **2504**, (A) **2856**
Bernard, P., magnetic effects of solar eruptions, **3880**; meter for quartz crystal frequency measurement, **812**; output analyser, **2497**
Bernardini, G., B. N. Cacciapuoti and B. Querzoli, electron component of cosmic rays in lower atmosphere, **3886**
Bernier, J., cavity resonators, calculation, **1378**, mathematical discussion, **376**; conversion efficiency of reflex v.m. valves, **2990**; numerical solution of integral equations of Fredholm and Volterra, **786**; theory of travelling-wave valve, **2974**, **4066**, (C) **4067**
Berry, C. E., computer for linear simultaneous equations, (D) **1839**
Berry, E. A., Jr, E. Bollay and N. R. Beers (Eds), Handbook of Meteorology, (B) **1084**
Bertein, F., cold emission from plane metal surfaces, **1741**; ellipticity of electrostatic lenses, **2202**; shape imperfections in electron-optical instruments, **1521**
Bertein, F. F., and É. Regenstreif, aberration of electrostatic lenses due to ellipticity, **2531**
Bertholet, F., contactors, survey, **1227**
Besson, R., aircraft approach system, **736**; characteristics of various capacitors, **653**; transmitting equipment of French, German, and American armies, **564**
Best, N. M., and R. D. Beebe, television aerials, close-spaced arrays, **3769**
Best, N. R., R. Havens and H. LaGow, atmospheric pressure and temperature to 120 km height, **3522**
—— and others, temperature and pressure measurements in stratosphere, **2116**
Bethe, H. A., effect of scattering on meson mass, **2102**; large air showers, (A) **3882**
—— and J. R. Oppenheimer, radiation and electron scattering, **701**
—— with R. P. Feynman, analysis of cosmic-ray phenomena, (A) **1437**
Bevan, P. A. T., high-power television transmitters, **3310**
Beyer, J. W., with others, multichannel microwave radio relay system, **1219**, (A) **4032**
Beynon, W. J. G., oblique radio transmission in ionosphere and the Lorentz polarization term, **2596**
—— with E. V. Appleton, ionospheric data and radio communication, **2895**
Bézy, G. H., technical problems in manufacture of cavity magnetrons, **2988**
Bhatnagar, S., National Research Laboratories of India, **2639**
Bhattacharyya, K. K., with H. Rakshit, 3-phase RC oscillator, **2256**
Bhowmik, B. B., manufacture of electrical measuring instruments in India, **1508**
Biefer, H., H. Keller and B. Matthias, properties and construction of crystal filters, **1696**
Biggs, J. A., double triplex beam aerial, **1680**
Biguenet, C., emission of W-Cs and W-Th cathodes, **1265**
—— and C. Mano, preparation of carbonates for oxide cathodes, **3924**
B.I.O.S., German infra-red photocells, (A) **1256**
Birger, N., with others, penetrating cosmic ray showers at 3860 m height, **1441**
Birks, J. B., dielectric housings for cm-λ aerials, **1343**; magnetic dispersion of iron oxides at cm λ, **748**
Bishop, D. K., high-speed waveguide switch, **2253**
Bishop, F. L., acoustics, architectural, correction by diffusion, **343**
Bishop, N., narrow-band f.m. for voice communication, **3275**
Bissmire, H. G. T., with others, automatic circuit tester for mass production, **2181**, (A) **3198**
Black, H. S., and others, multichannel microwave radio relay system, **1219**, (A) **4032**
Black, J. W., and H. M. Mason, training for radio or telephone speech intelligibility, **339**
Black, L. J., and P. L. Morton, current and power in v.m. valves, (D) **2278**
Blackett, P. M. S., cosmic rays, relevance to physical sciences, **3888**; magnetic field of massive rotating bodies, **3112**
Blackmer, L. L., with others, rapid production of photographic records, **459**
Bladier, M., electronic commutator, **2345**
Blanc-Lapierre, A., amplification of feeble photoelectric currents, **1714**; flicker effect in valves, **935**; photo-counters and Poisson's law, **2047**; Schottky effect, **1841**; shot effect and amplifier output fluctuation, **2048**
—— and P. Lapostolle, interaction between travelling wave and electron beam in transmission line, **1330**; propagation in a dispersive medium, **3505**
—— and others, theory of travelling-wave valve, **3421**
Blasi, E. A., and G. C. Schutz, test equipment and techniques for airborne radar field maintenance, **2498**
Blatterman, H. L., acoustic problems of a.m. broadcasting, **3908**
Bleaney, B., and R. P. Penrose, microwave absorption spectrum of NH_3, **3507**, **3870**
—— J. H. N. Loubser and R. P. Penrose, cavity resonators for measuring cm waves, **3187**
Blewett, J. P., oxide-coated cathode literature, 1940–1945, **942**
Blifford, I. H., and H. Friedman, voltage stabilization by corona discharge, (A) **3983**
Blitzer, R., wave and pulse counter, **1505**
Bloch, A., construction of dual networks, **3049**; zero tracking error in superheterodynes, **524**
Bloch, F., R. I. Condit and H. H. Staub, neutron polarization and ferromagnetic saturation, **2076**
—— M. Hamermesh and M. Phillips, radar reflections from long conductors, **1687**
—— with others, theory of radar reflection from wires, **3035**
Bloch, L., e.m. energy of isolated system, **3868**; principles of nuclear physics, **709**
Bloom, A., with V. W. Cohen, microphony in subminiature triode, (A) **3340**
Bloom, L. R., with others, mica windows as elements in microwave systems, **3021**
Blow, T. C., mutual inductance of concentric coils, **881**
Boadle, R. D., h.v. power supplies for c.r. tubes, **804**
Boast, W. B., with J. D. Ryder, a.c. network analyser, **362**, (D) **3042**
Boddie, C. A., notional mass of electron, **1735**
Bodier, G., transmission lines and lightning protection, **625**
Boé, L., conditions for high quality reception, **1191**; coupling quadripoles, **1387**
Bohlke, P. G., and F. G. Breeden, external cavity klystron, **4082**
Bohm, D., excitation of plasma oscillations, (A) **1061**
—— and L. Foldy, theory of synchrotron, **1542**
—— with L. Foldy, efficiency of f.m. cyclotron, (A) **1163**
Bol, K., with L. Marton, spherical aberration in magnetic lenses, (A) **1168**
Boldingh, W. H., and W. J. Oosterkamp, 400-kV X-ray equipment, **3617**
Boll, M., photophysics, **1058**
Bollay, E., with others, Handbook of Meteorology, (B) **1084**
Bolt, F. D., with F. C. McLean, transmission lines for broadcasting, (D) **3022**
Bond, E. B., and W. L. Bragg, Rutherford papers in Cavendish Laboratory, **1278**
Bondi, H., and S. Kuhn, concentric line, critical wavelengths, **3790**
Bondley, R. J., metal-ceramic seals, **3917**
Bonn, T. H., supersonic capacitor microphone for measurement, **331**
Bonnemay, M., mechanism of electrolysis, **713**
Booker, H. G., impedance concept and e.m. wave propagation, **3250**; meteorological effects on u.s.w. propagation, **516**; relation between slot aerials and wire aerials, **1335**
—— and W. Walkinshaw, mode theory of tropospheric refraction, [illegible]
Booth, C. F., and F. J. M. Laver, frequency standard and applications, (A) **186**, (D) **1143**
Boothby, O. L., and R. M. Bozorth, supermalloy, **2802**
Boothroyd, W., u.h.f. television relay system, **2586**
Bordoni, P. G., asymmetrical vibrations of cones, **1976**; capacitor microphones, survey and bibliography, **1309**
Borgnis, F., theory of electron-plasma oscillations, **2747**
Born, M., and H. W. Peng, quantum mechanics of e.m. fields, **687**
Bosley, W., betatron, **1541**
—— J. D. Craggs and D. H. McEwan, measurement of out-of-phase magnetic fields in betatrons, **2524**
Bossart, P. N., inductive system for train communication, **884**
Bosworth, R. C. L., thermal inductance, **70**
Böttcher, C. J. F., theory of internal electrical field, **2737**
Boughon, P., and P. Jacquinot, signals with rectangular frequency spectrum, **926**
Boughon, —, with others, quartz crystal equivalent circuit, **482**
Bousquet, A., with others, counting rate meter, **1150**
Bouthillon, L., discoverer of Biot-Savart law, **1065**; Joseph Bethenod, **2651**; radar, principles and applications, **1794**; radio work of Joseph Bethenod, **974**; symmetrical form of Maxwell's equations, **704**; tensors and electricity, **2476**
Bouwkamp, C. J., theory of acoustic radiation, **1304**
Bovill, C. B., radio aids in aviation, **2129**
Bowers, D. F., and E. F. Cranston, marine radio equipment, **4038**
Bowers, J. L., RC band-pass filter design, **3076**
Bowlus, O. E., and P. T. Nims, electronic frequency changers for aircraft, **3039**
Bowman, D. F., notch wattmeter for microwave pulse power measurement, (A) **1139**, **3195**
Boyd, B., grid-controlled rectifiers for r.f. heating, **199**
Boyer, J. L., with R. J. Ballard, ignitron converters, (A) **1154**, **3222**
Boyer, M. R., with C. F. White, film for television tube photography, **907**
Boyer, R. F., E. B. Baker and P. C. Woodland, dielectric properties of polymers, (A) **3170**
—— with W. C. Goggin, dielectric applications of plastics, **762**
Boyers, J. S., and R. E. Zenner, master wire sound recorder, (A) **2307**
—— with R. J. Tinkham, magnetic sound recorder, **1995**
Bozorth, R. M., magnetism, **3501**; magnetoresistance and domain theory of iron-nickel alloys, **2137**
—— with O. L. Boothby, supermalloy, **2802**
—— with W. A. Yager, ferromagnetic resonance at microwave frequencies, **3861**
Braaten, A. M., with G. S. Wickizer, propagation at 45.1, 474 and 2800 Mc/s, **3628**
Bradfield, G., J. G. Bartlett and D. S. Watson, c.r. tube problems in Service radar applications, **2984**
Bradford, H. K., wide-angle phase modulator, **2274**
Bradley, G. G., multichannel R T, **1591**
Bradley, W. E., single-stage f.m. detector, **227**, (A) **1188**, **3264**
—— with D. B. Smith, impulse noise in f.m. receivers, **857**
Bradshaw, E., demonstration valve oscillator, **3053**
Braestrup, C. B., with others, X-ray absorption measurements, **836**
Bragg, W. L., with E. B. Bond, Rutherford papers in Cavendish Laboratory, **1278**
Braillard, R., acoustic problems of broadcasting, **1307**
Brajnikoff, B. J., Al and Mg in electrical industry, **1233**; h.v. e.s. generators, **4041**
Bramhall, F. B., radio relays for telegraphy, **876**, **2934**
Bramley, E. N., with W. Ross, lateral deviation at sunrise, **2125**
Brann, A., nomenclature system for glass bulbs, **2975**
Bras, —, survey of u.s.w. propagation in England, **1563**, (D) **3633**
Braude, G., mosaic for television pickup tubes, **2957**
Braude, S. Ya., and I. E. Ostrovski, propagation of u.s. waves in line of sight, **2549**; secondary emission in magnetrons, **3733**
Braun, A., Der frequenzstabile Schwingtopf-Generator, (B) **1726**
—— and G. Busch, mechanism of voltage-dependent resistors, **2344**; thermo-emission from C, Si and SiC, **2801**
Bray, R., and K. Lark-Horovitz, photo- and thermo-effects in *p*-type Ge rectifiers, (A) **2456**
Breazeale, W. M., noise and conversion gain measurements, **2229**
Breckenridge, R. G., with others, ceramics with high dielectric constant, **759**
Breeden, F. G., with P. G. Bohlke, external cavity klystron, **4082**
Brekhovskikh, L. M., with P. A. Ryazin, radio waves between two semiconducting surfaces, **2889**
Brereton, C. H., with J. B. Knox, multichannel v.h.f. radio communication system, **2927**
Breskin, C. A., annealing styrene for strain removal, **2160**
de Bretteville, A., Jr, dielectric properties of $BaTiO_3$, **1108**
Brewitt-Taylor, E. G., polar diagram of dipole with parabolic mirror, **1357**, (A) **1683**
Brian, M. V., with G. A. R. Tomes, electronic tracking of beetles, **485**
Bricard, J., thunderclouds and Wilson's mechanism, **2121**
Bricout, P., mathematical representation of hysteresis cycles, **1746**; theory of ferromagnetic inductances, **2021**; transformer theory, **893**
Bridge, H., cosmic-ray ionization bursts, (A) **3882**
—— and B. Rossi, cosmic-ray bursts, **2766**
Brieu, J. J., 10-kW s.w. telegraphy transmitter, Type TH 1343, **2603**
Briggs, B. H., anode-follower circuits, **2050**
Briggs, R., and H. Klemperer, spot welder, **3618**
Brill, E. R., nonlinear limiter, **2691**
Brillouin, L., magnetron electron trajectories, **2632**; space charge and bunching of electron beams, **75**, (A) **1258**; Wave Propagation in Periodic Structures: Electric Filters and Crystal Lattices, (B) **1907**; waveguides for slow waves, (A) **3020**
Brine, P. J., and J. W. Whitehead, null indicator for impedance bridge measurements, **1516**
Brinkmann, C., types of G-M counters, **1869**
Briot, A., cavity resonators, mathematical treatment, **1379**
British Association for the Advancement of Science, Legendre Polynomials, (B) **2160**
Britton, G. P., insulating materials in radio engineering, (AD) **2144**
Broadhurst, J. W., and others, automatic control in chemical industry, (A) **4039**
Brobeck, W. M., and others, cyclotron, University of California, **3234**
Brock, W. R., with A. H. Brolly, c.r. tube for television transmitter modulation measurement, **808**
Brode, R. B., with W. B. Fretter, mass of meson, (A) **1430**
Brode, W. R., with others, plastic optical and infra-red filters, **3541**
Broderick, F. C., with others, automatic control in chemical industry, (A) **4039**
Brodski, V. B., cavity resonators coupled by aperture, **3482**
de Broglie, L., limits of sensitivity of electron microscope, **1545**, **1866**
Brolly, A. H., and W. R. Brock, c.r. tube for television transmitter modulation measurement, **808**
Bromberger, N., characteristics and manufacture of insulating varnishes, **444**
Brooke, E. R., winding machine for toroidal coils, **3672**
Brookfield, K. J., and others, diffusion from plane surface, **3494**
Brooks, A. A., with W. Grey Walter, portable 2-channel amplifier and recorder, **3478**
Brooks, C. E. P., climate, and deterioration of materials, **132**
Brooks, H. B., wind velocity measurement and storm detection, **100**
Brotherton, M., Capacitors—Their Use in Electronic Circuits, (B) **684**
Browder, J. E., and V. J. Young, loop-aerial input circuit design, **2683**
Brown, A. F., and W. M. Jones, electron microscopy replica technique, **3239**
Brown, B. B., with others, magnetron for beacon service, **3736**
Brown, B. W., with L. F. Curtiss, measurement of β rays, **710**
Brown, F. M., L. L. Blackmer and C. J. Kunz, rapid production of photographic records, **459**
Brown, G. E., military applications of infra-red viewers, (A) **1154**, **3231**
Brown, G. H., and W. C. Morrison, RCA antennalyzer, **1837**
—— and O. M. Woodward, Jr, circularly-polarized omnidirectional aerial, **3425**
Brown, G. S., and A. C. Hall, design and behaviour of servomechanisms, **246**
Brown, J. B., and D. K. C. MacDonald, use of Brownian motion for low temperature thermometry, **2185**
Brown, J. S., folded unipole emergency aerial, **636**
Brown, L. W., production of waveguide transmission systems, **1326**
Brown, S., with others, design of β- and γ-ray G-M counters, **464**
Brown, S. C., diode pre-corona discharge as reference potential, **1596**
Brown, W., with others synchronizing-signal generators, **3489**
Brown, W. C., microwave generator, (A) **3449**
Bruce, C. E. R., solar "static", (D) **3104**
Bruce, F. M., ellipsoid voltmeter for high a.c. voltages, **3584**; h.v. measurement, (A) **472**, (A) **1132**, spark-gap calibration for, **3585**
Bruck, G. G., frequency modulator, **1959**
Bruck, H., electron microscope limit of resolution, **3238**, resolution, **3613**; resolution of e.s. objective, **4003**
—— and L. Romani, properties of e.s. lenses, **1544**
—— with P. Grivet, e.s. electron microscope, **1166**
Bruene, W., and N. Hale, amateur band transmitter, **927**
de Bruijn, N. G., van der Pol's equation, **3814**
Brunetti, C., wiring techniques, (A) **3079**
—— with W. S. Hinman, Jr, radio proximity-fuse, **1555**
Bruzau, M., piezoelectric substances, **2445**
Bryden, J. E., transmission measuring set for 0.1 to 11 c/s, **2511**
Brylinski, E., absolute systems of units, **3842**; force between parallel currents, **1745**; force on current element in magnetic field, **1747**; induced magnetization and magnetic moments, **1410**
Bubert, J., current and voltage meters, **801**
Buckingham, W. D., and C. R. Deibert, concentrated-arc lamp, beam modulation, **3691**
Buckley, H., National Physical Laboratory and industry, **1654**
Budeanu, C., probability of electron conduction motions, **2746**
Buechner, W. W., and R. J. Van de Graaff, radiation losses of β rays, **77**
—— with E. S. Lamar, ion beams in h.v. tubes, **2627**
Buff, C., frequency shift keying techniques, **275**
Bulashevich, Y. P., origin of geomagnetism, **89**, **1444**
Bulatov, N. D., solar eclipse of 9th July 1945 and wave propagation, **2412**
Bull, E. W., and V. A. Stanley, e.s. *vs* e.m. deflection in c.r. tubes, (AD) **304**
Bullington, K., radio propagation above 30 Mc/s, (A) **1178**, (A) **3255**
Bunting, E. N., G. R. Shelton and A. S. Creamer, Ba-Sr titanate dielectrics, **3551**
Bureau, R., atmospherics, effect of λ on level, **2123**, and solar activity, **1564**, and sunspot cycle, **2122**; solar activity and wave propagation for λ 20–24000 m, **2550**
Burgaud, M., solar faculae and short period geomagnetic activity, **92**
Burger, E. E., Fernico from metal powders, **1482**
Burgess, J. S., with L. R. Koller, secondary emission from Ge, B and Si, **746**
Burgess, R. E., Doppler effect in propagation, (D) **4008**; oscillator response to external e.m.f., (D) **382**; partially-screened open aerials, **2681**; permeability of iron-dust cores, (D) **35**
Burkett, R., impregnated transformer windings, (D) **134**
Burns, R. S., with G. H. Cole, radar transformer steel, **1834**
Burnside, D. G., with others, pulse triodes for 1 MW at 600 Mc/s, **2982**
Burrell, O. J., with others, re-radiation and aerial power gain measurements, **1345**
Burridge, W., false preconceived notions, **1652**
Burroughs, F. L., with H. R. Traver, microwave spectrum analysers, **2855**
Burrows, W. H., charts, construction, **1126**
Burton, E. F., and W. H. Kohl, Electron Microscope, (B) **1897**
Busch, G., conductivity law of semiconductors, **698**; conductivity of SiC, **745**
—— and E. Ganz, dielectric measurements on KH_2PO_4 and KH_2AsO_4 at low temperature, **2451**
—— and H. Labhart, mechanism of conductivity of SiC, **1820**
—— with A. Braun, mechanism of voltage-dependent resistors, **2344**; thermo-emission from C, Si and SiC, **2801**
Bush, E. T., with others, absorption of microwaves by gases, thermal and acoustic effects, **2757**
Bush, R. R., with others, 1-kW f.m. magnetron for 900 Mc/s, **3731**
Busbby, T. R. W., standardization of radio components, **978**
Busignies, H., P. R. Adams and R. I. Colin, Navaglobe, Navar, Navaglide and Navascreen, **1092**
Butler, C. C., with others, meson production in lead, **2415**
Butler, F., class-B a.f. amplifiers, **623**
Butler, F. E., mobile R/T service, **4035**
Butterworth, A., recording magnetometer, (A) **1137**
Buys, W., aerials, theory and practice, **21**
Buzalski, T. J., modulation measurement of television signal, **3563**
Bykhovskaya, L., with B. Granovsky, oscillations in low-pressure arc discharge, **2067**

C

Cabannes, J., J. Dufay and Tcheng Mao Lin, solar activity and luminescence of earth's upper atmosphere, **3105**
Cabessa, R., with A. G. Clavier, u.s.w. measurement with *Q* meter and wattmeter, **1506**
Caccipuoti, B. N., with others, electron component of cosmic rays in lower atmosphere, **3886**
Cadman, W. H., colloidal carbon, **1486**
Cadwell, C. L., with C. V. Fields, porcelain insulators at high altitudes, **442**
Cady, W. G., Piezoelectricity, (B) **2684**
Cafferata, H., radiation formula for horizontal rhombic aerials, **1015**
Cahen, R. R., high-definition television equipment, **915**
Callaham, L. I., Russian-English Technical and Chemical Dictionary, (B) **3380**
Callendar, M. V., *Q* of solenoids, **3046**
Callouette, J. O., with E. F. Riesing, rubber in 1946, **3947**
Calpine, H. C., with others, naval fire-control radar, **1798**
Campbell, A. T., lateral disk sound recording, **348**
Campbell, J. H., and C. G. Donsbach, valve test analysis, **582**
Campbell, N. R., and L. Hartshorn, experimental basis of electromagnetism, **3091**
Campbell, W. L., interference reduction with beam aerial, **4021**
Camras, M., magnetic recording for motion picture film, **1997**, **3416**
Cauper, J. F., h.f. heating, **2577**
Capps, F. L., gramophone needles for recording, **616**

Cappuccini, F., u.h.f. oscillations in ordinary valves, 3080
Carbenay, F., m- and cm-λ radiation measurement, 1863 ; pulse generator for standardizing atmospheric recorders, 3471 statistical recorders of e.m. fluctuations, 2251
Cardot, C., and M. Bergeron, radio stations near Toulouse, 527
Carini, L. F. B., Drafting for Electronics, (B) 2724
Carlevaro, M., with others, interaction of waves in ionosphere, 513
Carlisle, R. W., [illegible] reproduction, (A) 2307
—— with others, midget earphones for military use, 347
Carlson, A. E., with C. Struyk, copper plating, 448
Carlson, J. F., and A. E. Heins, reflection of plane wave by infinite set of plates, 2756, 3504
Carman, R. D., with others, r.f. measurements on rhombic aerials, 1857
Carnahan, C. W., N. W. Aram and E. F. Classen, Jr, 45.5 and 91 Mc/s field strength measurements, 2214
Carrelli, A., Hall effect in Bi-Sb alloys, 3873
Carrington, E., anodizing, 143
Carstensen, E. L., and L. L. Foldy, propagation of sound through liquid containing bubbles, 3388
—— with others, sound diffraction round circular disk, 1978
Carter, C. J., H_2S radar system, 1793
Carter, W. C., and others, dielectric properties of rubbers, 2815
Carter, W. H., Jr, with others, rapid-response bolometers, 1730
Cary, H., and K. P. George, sensitive high-speed radiation thermocouple, (A) 2843
Cary, R. H. J., with others, wide-band aerials and transmission lines for 20–85 Mc/s, 1318
Cashman, R. J., photodetectors, (A) 1154, 3330
Casimir, H. B. G., magnetron for d.c. voltage amplification, 3350 ; Onsager's principle of microscopic reversibility, 65
Cayrel, J., oscillatory circuit excited by interrupted d.c., 2039
Cazalas, A., astigmatism and focal surfaces in electron optics, 4002 ; origin of trapezoidal distortion in c.r.o., 1949
Chadwick, E. W., Se rectifiers, in voltage multipliers, 2256, in power supply units, 2582
Chaffee, E. L., with E. C. Easton, pulse-type valve tester, 1858
Chai, Yeh. See Yeh, Chai
Chakrabarty, S. K., geomagnetic diurnal variation and ionosphere, 729
Chakrávarti, S. P., broadcast wavelengths in India, 1942 ; effect of atomic bomb on reception at Bangalore, 851 ; radio communications, 1896–1946, survey, 1294
—— and — Rajeswari, band-pass effect in crystal resonator, 1721
—— with — Rajeswari, extension of band-pass effect at h.f., 1720
Chakravarty, I. L., temperature and frequency drift in a receiver, 2567
Chalfin, N. L., crystal control for v.h.f. receiver stability, 1363 ; modernizing pre-war television receivers, 557 ; 1N34 crystal as f.m. frequency discriminator, 2713
Chalk, J. H. H., with others, diversity reception, 1820
Chalmers, J. A., atmospheric electricity and rate of ionization, 1782
—— and E. W. R. Little, currents of atmospheric electricity, 3905
Chamagne, —, and — Guyot, microphony of valves, 2339
Chambers, C. V., 6-m transmitter, 2271
Champeix, R., oxide-cathode valves, anode current variations, 2289, space-charge currents, 3723
Champetier, C., with others, infra-red spectroscopy of molecular groups, 2061
de Champs, G., universal receiver RU95, 4014
Chance, B., wave-shaping and time-measurement circuits, 1710
Chanson, P., A. Ertaud and C. Magnan, first-order elements of e.s. lenses, 835
—— with others, cosmic ray showers, 1768
Chapman, G. D., weathering of light alloys, 1109
Chardon, G., cable splicing with systematic permutation, 3778
Charles, D., measurement of weak a.c. magnetic fields, 2753
Charlton, E. E., and G. C. Baldwin, betatron accelerator in nuclear physics, (A) 1154 ; 100-MeV betatron, (A) 1154, 3233
Chase, H., copper-base powder metallurgy parts, 1833
Chatfield, H. W., and J. H. Wreddon, Varnished Cloths for Electrical Insulation, (B) 152
Chatterjee, S. K., suppressor-grid modulation at u.h.f., 2275
Chaudhury, S. G., conductivity of strong electrolytes, 712
Chauvierre, M., components, design trends, 1399, French exhibition of, 1062 ; television, in France, development and line standard, 1241, line standard in France, 2589, on single carrier wave, 1598, in U.S.A., 2590
Chavasse, P., artificial voice, 3494 ; intensity levels in modern acoustics, 827 ; silent room of Centre National d'Études des Télécommunications, 3902
Cheng, D. K., coupled-circuit oscillators, (A) 3459
Chernosky, E. J., with others, ionosphere and solar eclipse of Jan. 1944 at Huancayo, 603
Cherrill, F. R., radio transmission of finger prints, 498
Cherry, W. H., with J. A. Rajchman, electron mechanics of betatron, 3897
Chesley, F. G., with others, ceramics with high dielectric constant, 758
Chevallier, A., transmissions on grid systems, 2574 ; h.f. attenuation in 3-phase line, 2806 ; propagation along 3-phase line, [illegible]
Chezlemas, R., with P. Lejay, ionosphere soundings in France, April–June 1946, 726
Chinn, H. A., gramophone needle standardization, 615
—— and P. Eisenberg, broadcast listeners' preferences, (D) 612
Chireix, H., u.h.f. multiplex link calculation, 1569, 2902, (D) 3629
Chrétien, L., amplifier with high musical fidelity, 1047 ; distribution of acoustic power, 2317 ; frequency-changing circuits, 648 ; l.f. resistance amplifiers, 990 ; loudspeaker feed circuits, 3770 ; tetrode *vs* pentode, 952
Christiansen, W. N., directional patterns of rhombic aerials, 644 ; exponential transmission line, 3023, 3792
—— and J. A. Guy, 8-wire transmission line, 3793
—— W. W. Jenvey and R. D. Carman, r.f. measurements on rhombic aerials, 1857
Christopher, A. J., and J. A. Kater, mica capacitors for carrier telephone systems, 374, (D) 3050, (A) 3458
Christy, R. F., with M. M. Mills, Auger showers, (A) 2417
Chubb, A. A., telephone relays, 3294, 3673
Chung, Kwai Lai, with R. Nagy, thermal and X-ray analysis of phosphors, 3530
Cinema-Television Ltd, metal detectors, 214
Clack, G. T., television fading due to aircraft reflection, 923
Clapp, C. W., distortion noise meter, (A) 3591
Clare, J. D., twin-triode phase-splitting amplifier, 2938
Clark, A. F., magnetic fields due to dee structure in synchrotron, (A) 1543
Clark, C. W., with D. H. Andrews, r.f. detection by superconductivity, 1915, (A) 3353
Clark, E., with A. Wright, television receivers, (A) 3686
Clark, F. M., effect of semiconducting liquids on properties of cellulose insulation, 2458
Clark, H. A. M., cm radar for precision gun-laying, 2791
Clark, J. S., I. A. Getting and J. E. Thomas, Jr, electron beam displacement in synchrotron, 832
Clark, J. W., and A. L. Samuel, u.s.w. reflex oscillator with wide tuning range, 2291
Clark, W. R., electronic recording instruments, (A) 2948
Clarke, A. C., astronomical radar, 186, (C) 731
Clarke, C., atmospherics and their location, (A) 1786
—— with F. Adcock, thunderstorm location by d.f., (A) 2126, 2770, (A) [illegible]
Clarke, G. L., with others, cavity accelerator for electrons, 3999
Classen, E. F., Jr, with others, 45.5 and 91 Mc/s field strength measurements, 2214
Clauser, H. R., electroforming in precision work, 2150
Clausing, A., loudspeaker test equipment, 1312
Clavier, A. G., attenuation and *Q* factors in waveguides, 2328
—— and R. Cabessa, u.s.w. measurement with *Q* meter and wavemeter, [illegible]
—— and G. Phélizon, R/T circuits, 540
Clayton, R. J., and others, u.h.f. radio measurements, (D) 1120
Cleckner, D. C., aerial radiation pattern plotting, 2017 ; models for aerial design, (A) 2611
Clegg, W. E., preparation of technical papers, 308
Clément, P., with others, infra-red spectroscopy of molecular groups, 2061
Clementel, E., with N. Dallaporta, cosmic shower theory, 2416
Clifford, F. G., design of tuned transformers, 2342
Clifford, W. K., Common Sense of the Exact Sciences, (B) 1467
Coales, J. F., H. C. Calpine and D. S. Watson, naval fire-control radar, 1798
Cobine, J. D., and C. J. Gallagher, hot-cathode arcs, oscillations, 1406, oscillations and noise in, 2400 ; noise in gas valves, 2401
Cocconi, G., density spectrum and origin of cosmic-ray showers, 2111
—— and V. Tongiorgi, mean life of meson, 2104 ; zenithal variation of cosmic radiation, 2103
—— A. Loverdo and V. Tongiorgi, cosmic-ray showers, density spectrum, 2108, 2109, 3889, penetrating particles, 2110
Cockcroft, J. D., Rutherford, life and work after 1919, [illegible]
Cocking, W. T., deflector coil coupling, 558 ; e.m. frame scanning, 272 ; television, factors for good interlacing, 2600 e.m. deflection, 2601, h.v. supply, 4047, sound rejection, 922, synchronization problems, survey, 2261 ; Television Receiving Equipment, (B) 2966, 3689 ; Wireless Servicing Manual, (B) 2572
Cockrell, W. D., multicolour printing, (D) 3228 ; radar techniques in industrial control, 3606 ; saturable reactors for automatic control, 1228
Codd, W. A., transmission rating of telephone systems, 1203, (D) 3273
Coeterier, F., u.s.w. reflex oscillator, 2628
Coggeshall, N. D., ion paths in crossed electric and magnetic fields, 1526
Cogman, A. J., vibration measurement apparatus, 3217
Cohen, B., Handbook of Telecommunication (Telephony and Telegraphy over Wires), (B) 323
Cohen, V. W., and A. Bloom, microphony in subminiature triode (A) 3340
Cole, G. H., and R. S. Burns, radar transformer steel, [illegible]
Cole, R. A. L., valve crate design, 2153
Colebrook, F. M., Basic Mathematics for Radio Students, (B) 162
Coles, D. K., and W. E. Good, microwave spectroscopy, Stark and Zeeman effects, (A) 3867
—— with W. E. Good, microwave absorption of NH_3, (A) 3868, of $N^{14}H_3$ and $N^{15}H_3$, 3097
Colin, R. I., with P. R. Adams, long range radio navigation system, Navaglobe, (A) 1089, 3140, operating conditions, 1086
—— with others, Navaglobe, Navar, Navaglide and Navascreen, 1092
Colino, A., induction currents due to electron motion, 1269 ; partially-screened open aerials, (D) 3800
Collacott, R. A., research and development in radio technology, 975
Collie, C. H., D. M. Ritson and J. B. Hasted, dielectric properties of water, 2844
Collins, S. C., He cryostat, 3495
Colombani, A., harmonic analyser, 810 ; theory of electric filters, 652
Coltman, J. W., with W. Altar, microwave impedance plotting device, 3571
Colvin, J. D., planning a studio installation, 4034
Combined Intelligence Objectives Subcommittee, television in France, (A) 270, (C) 2265
Commin, A., with others, glass in radio industry, 2819
Comstock, E. E., rectifier circuit, 903
Condit, R. I., with others, neutron polarization and ferromagnetic saturation, 2076
Condon, E. U., Bureau of Standards wartime activities, 3743 ; electronics and the future, 3371
Connelly, F. C., B9A valve bases, 957
Conrad, M., and B. L. Pacella, simplified encephalophone, 2350
Contassot, M., 3-channel amplifier, 373
Content, E. J., acoustical design of f.m. studios, 2680
Conversi, M., and O. Piccioni, slow mesons, mean life, 2105, disintegration, 2106
—— E. Pancini and O. Piccioni, absorption and disintegration of mesons, 3885
Cook, J. H., airborne search radar, 110
Cook, L. E., with others, rural carrier telephone systems, (A) 3271
Cook, R. K., measurement of microphone output e.m.f., 3491
—— M. Greenspan and P. G. Weissler, thermal voltage of quartz crystal, (A) 3848
Coomes, E. A., pulsed properties of oxide cathodes, 943
Corke, D. M., fatigue testing, 3218
Cornell, J. I., capacitors, metallized, 1365, metallized paper, (A) 2029
Correll, M., slow mesotrons at 11500 ft, (A) 3882
Corrington, M. S., f.m. distortion due to interference, 3266 ; table of integral $(2/\pi)\int_0^x (1/t)\tanh^{-1}t\,dt$, 2886
Cosslett, V. E., Introduction to Electron Optics, (B) 1173 ; resolution limit of electron microscope, 3614
Cotte, M., propagation of elastic waves in piezoelectric medium, 2057 ; theory of surge waves in parallel overhead lines, [illegible]
Cotton, H., Electric Discharge Lamps, (B) 986
Couanault, G., and P. Herreng, standard generator, 3970
Coudert, A., simplified television receiver, 2596
Couillard, L., with P. Giroud, radio altimeter for aircraft, 3912
Coudrier, S., telecontrolled motor car, 2538
Couffignal, L., stability conditions of oscillatory systems, 1497
Coulombe, P., ladder-type filter calculation, 1023
Courtener. See Kurtener
Covington, A. E., solar noise during partial eclipse, 2761
Cowan, F. A., with others, rural carrier telephone systems, (A) 3271
Cowan, F. P., with D. R. Schench, pulse generator with variable time delay, 256
Cowley, J. M., and A. L. G. Rees, refraction effects in electron diffraction, 396
Cowling, T. G., growth and decay of sunspot magnetic field, 3509
Cox, J. W., discussion on the ionosphere, (D) 3129
Coxhead, H. B., with others, reflection of sound signals in troposphere, 330, (A) 3751
Coxon, W. F., zinc plating, 3927
Craggs, J. D., and W. Hopwood, spectroscopic analysis using electron multiplier, 831
—— and A. A. Jaffe, spread of discharge in Geiger counters, 2865
—— with others, measurement of out-of-phase magnetic fields in betatrons, 2524
Cramer, C. H., sunspots and telegraphy, 3878
Cranch, L. W., with N. Fetherston, powder metallurgy and radio engineering, 2818
Cranston, R. F., with D. F. Bowers, marine radio equipment, 4088
Craven, G. F., and G. R. O. Vermeir, cancellation of even-harmonic distortion in push-pull operation, 2719
Crawford, A. B., and W. M. Sharpless, angle of arrival of microwaves, 1183, (A) 4009
Crawford, F. H., donutron, tunable squirrel-cage magnetron, (A) 1258
—— and M. D. Hare, donutron, tunable squirrel-cage magnetron, (A) 947, 2967, (A) 3342
Crawley, J. W., with others, automatic circuit tester for mass production, 2131, (D) 3298
Crawley, W. J., r.f. mixer design for v.h.f., 3641
Creamer, A.S., with others, Ba-Sr titanate dielectrics, 3151
Creamer, J., and W. B. Hoffman, Radio Sound Effects, (L) 1000
Creveaux, H., with C. Guillaud, preparation and magnetic properties of Fe_4N, 131
Creveling, C. J., and L. Mautner, automatic-slideback peak voltmeter for pulses, 2176
Crew, W. H., function of American Standards Association, 1279
Cripwell, F. J., and G. B. B. M. Sutherland, absorption of cm waves by liquid dielectrics, 2840
Crisp, D. J., with J. Forman, absorption spectra of solutions of electrolytes, 2731
Crittenden, E. C., Jr, C. S. Smith, Jr, and L. O. Olsen, B H meter for small cross-sections, 1853
Cromie, E. E., with others, re-radiation and aerial power gain measurements, 1345
Crosby, M. G., with D. M. Hill, design of f.m. signal generator, 618
Cross, P. C., with others, microwave absorption of water and related molecules, 3039
Crossley, A., [illegible], (A) 1154, 3214
Crotinger, R. M., [illegible] measurements, 2177
Crout, P. D., electric field plotting, application to magnetron, 3580
Cuccia, C. L., with others, magnetron, for beacon service, 3736, [illegible], 3731
Cuffe, R. C., lightning protection on h.v. lines, (A) 1947
Cullen, A. L., and F. K. Goward, slot aerial array for given radiation pattern, 1352
Cullinan, C. A., [illegible] broadcast transmitter, 562
Cummerow, R. L., D. Halliday and G. E. Moore, paramagnetic resonance absorption of salts at 9000 Mc/s, (A) 3866
Curtis, F. W., High-Frequency Induction Heating, (B) 217
Curtis, L. F., metal detectors, (A) 1154, 3244
Curtiss, L. F., and B. W. Brown, measurement of [illegible], 710
Curtius, E. W., audio measurements laboratories, 470
Cutler, C. C., field in travelling-wave valve, (A) 3715
Cutolo, M., M. Carlevaro and M. Gherghi, interaction of waves in ionosphere, 513
Czepek, R., humidity measurement in air and gases, 429

D

Daeschler, A., Elektronenrohren, (B) 564
Dahl, E. A., train position indicator, 535
Dain, J., with F. K. Goward, synchrotron beam ejection, 3232
Dale, A. E., and J. E. Stanworth, sealing glasses, 1467
D'Alelio, G. F., Experimental Plastics and Synthetic Resins, (B) 1123
Dallaporta, N., and E. Clementel, cosmic shower theory, 2416
Dallas, T., with [illegible], knock pickup amplifier, [illegible]
Dalle, —, conference on European air routes and radio facilities, 584
Daly, E. F., and G. B. B. M. Sutherland, infra-red spectroscope with c.r. presentation, [illegible]
Dalziel, C. F., dangerous electric currents, 310, (D) 3368
Daniels, F. B., acoustical impedance of enclosures, 3749
Danzin, A., with others, glass in radio industry, 2819
Darbyshire, J., with others, frequency analysis of ocean waves, 203
Darrieus, G., electron and e.m. theory, 3496
Das Gupta, M. K., with others, location of thunderstorm centres, 3132
Das Gupta, N. N., and S. K. Ghosh, Wilson cloud chamber applications, 79
Dasgupta, S. M., amplitude modulation meter for receiving stations, 1355
Date, W. H., Second Year Radio Technology, (B) 3384
Dau, W. K., with E. L. Deeter, 0.1 to 100-second interval timer, 3990
Daudin, J., mesons and slow particles, 2098, 2099
Daunt, J. G., magnetic threshold curves of superconductors, 3852
Dauvillier, A., monitor for geomagnetic storms, 723
Davidenko, V. A., mechanism of conductivity in semiconductors, (A) [illegible]
Davidson, C. F., R. C. Looser and J. C. Simmonds, power loss in e.m. screens, 33
Davies, G. L., VT-127-A valve in amateur transmitters, 925
Davies, G. T., with others, zero error of range in radar equipment, 1806
Davies, H., and G. G. Macfarlane, radar echoes from sea surface at cm λ, 3257
Davis, H., and L. Lader, trends in air navigation, (A) 3137
Davis, M. E., with others, acoustic effects of marine fouling, 3399
Davis, R., A. E. W. Austen and W. Jackson, voltage characteristics of polythene cables, 3179, (A) 3959
Davis, T. McL., and E. Toth, naval communications receiver design for v.h.f. and u.h.f., 2222
Davis, W., with B. A. Penners, design of electronically regulated power supplies, 2947
Davy, N., electric field in rectangular conductors, 73
Davydov, B. I., concentration phenomena in semiconductors, (A) 1828
—— and I. M. Šmuškevič, electrical conductivity of semiconductors in strong electric fields, 1818
Dawe, P. G. M., and A. S. Gladwin, phase-shift oscillators, 2255
Dawson, L. H., and N. M. Rust, wide-band linear array aerial, 1353
Day, J. P., with others, cm-λ attenuation in rain, (A) 1181, 2553
Dean, M. H., speech-clipping circuits, 3477
Dearnley, I. H., with others, de-ionization time of t.r. switches, 1683
DeBenedetti, S., with others, fast coincidence circuit with pulse height selection, (A) 3805
Deeter, E. L., and W. K. Dau, 0.1 to 100-second interval timer, 3990
De Hart, W. R., electronic key, 255
Deibert, C. R., with W. D. Buckingham, concentrated-arc lamp, beam modulation, 3691
Delaby, H., Paris television centre, 1606, 3684
Delanoy, F., squelch circuits, design and application, 519, 520
Delattre, M., parallel operation of Se photocells, 2280
Delavenne, R., with L. Katchatouroff, h.f. impedance bridge, 3960
Della Corte, M., fluctuations in cosmic ray showers, 2113
De Ment, J., nature of neutrons, 398
Denamur, H., with others, cosmic ray showers, 1768
Deneke, A. W., television aerial on top of skyscraper, 3432
Denisse, J., r.f. radiation by solar atmosphere, 1759
—— and J. L. Steinberg, h.f. energy of ionized gas in magnetic field, 2406
—— with J. L. Steinberg, galactic and solar r.f. noise, survey, 1575
Dennison, D. M., with H. H. Nielsen, anomalies in microwave spectrum of NH_3, 3871
Denny, C. R., future problems of electronics and communications, 3274
Dent, H. B., noise limiters, 366
De Oyarzabal, J., with others, cosmic radiation, energy spectrum, (A) 1434
Department of Scientific and Industrial Research, A.C.E. computing machine, 1157
Depp, W. A., with others, spark gap switches for radar, 899
Déribéré, M., applications of infra-red lamp radiation, 2878
Derr, W. A., W. A. Keller and H. A. W. Hedke, telecontrol of water pumping station, 840
Descarsin, M., industrial applications of h.f., 2874
Deshpande, G. S., with others, rhombic aerials and matching circuits for reception, 1678
DeSorbo, W., with others, superconducting bolometer for infra-red detection, [illegible]
Destouches, J. L., with P. Destouches-Février, wave mechanics and quantum theory, 1393
Destouches-Février, P., and J. L. Destouches, wave mechanics and quantum theory, 1393
Detwiler, W. L., graphical harmonic calculator, 2026
D'Eustachio, D., surface layers on quartz and topaz, 754
Deutsch, M. E., relativistic misconception, (D) 686
Devaux, J., absorption of X rays, 3857 ; electron diffraction, 3597, study of insulating materials by, 757
—— and A. Guinier, X-ray absorption coefficient measurement, 2069
Devereux, W. C., Al in industry, 3471
DeVore, C., wartime words and their meanings, 4093
Devyatkova (Devjatkova), E. D., I. P. [illegible] and M. S. Sominskii, thermoelectric effect in PbS, 1821
Dewan, R. N., [illegible] vibro converter, 1945
Dicke, R. H., thermal radiation measurement at u.h.f., 475
—— and R. Beringer, microwave radiation from sun and moon, 3108
—— and others, atmospheric microwave absorption measurement, 1843
—— with others, 1-cm absorption in water vapour, (A) 219
Dickey, D. S., quartz crystal testing, 167
Dickey, J., with others, crystal networks, (A) 3460
Dickson, D. C., Jr, with C. M. Slack, microsecond radiography, 3240
Diesselhorst, H., magnetic moment, and magnets in permeable media, 1409
Dieterle, W., 3-phase rotating-field transmitter for u.h.f., 2605
[illegible], D. T. R., and H. McG. Ross, c.r. instrument for camera shutter testing, 3230
[illegible], E., with P. Kounitz, voltage-regulated power supplies, 4046

DiMattia, A. L., and F. M. Wiener, pressure calibration of capacitor microphones, **334**
Dinger, H. E., and H. G. Paine, accuracy of noise meters, **2227**
Dinger, J. E., and R. Gunn, electrical effects with change of state of water, **1780**
Dippy, R. J., Gee navigation aid, **1789**
Dishal, M., band-pass amplifier design, **3065**
DiToro, M. J., network distortion, (A) **3451**
Divoire, É., Précis de Radioélectricité, (B) **608**
Dixon, J. T., electroplex automatic key, **1699**
Dobrotin, N. A., ionizing power of hard and soft cosmic rays, **1436**
—— with others, cosmic ray intensity measurement, **3883** ; highly ionizing particles in cosmic radiation, **1765, 2763**
Dodd, C., with E. N. da C. Andrade, effect of electric field on viscosity of liquids, **391**
Dodds, W. J., with C. P. Vogel, stabilized magnetron, **3737**
Dole, F. E., with L. A. Nettleton, potentiometers, improvement of performance, **1691**
Dohnke, L., power valves, **1261**
Dolph, C. L., current distribution for broadside arrays, (D) **2685**
Dolphin, W. P., noise signal generator, **2858**
Domb, C., resultant of events of random phase, **278**
Dome, R. B., carrier-difference reception of television sound, **1612**, (A) **3315** ; wideband phase-shift networks, **1021**
Donal, J. S., Jr, C. L. Cuccia and B. B. Brown, magnetron for beacon service, **3736**
—— and others, 1-kW f.m. magnetron for 900 Mc/s, **3731**
—— with others, magnetron modulation, (A) **3698**
Donn, W. L., Meteorology with Marine Applications, (B) **1083**
Donnay, J., 2-channel broadcasting system on single carrier wave, **1928**
Dousbach, C. G., with J. H. Campbell, valve test analysis, **582**
Dorfman, J., magnetic and chemical properties of Ni and Fe alloys, [illegible]
Dorgelo, H. B., and J. A. Schouten, units and dimensions, **1382, 2383**
Double, H. S., saturable-choke-controlled rectifiers, **546**
Doucerain, M., electronic heating, **1529**
Doucet, M., documentation in engineering, **963**
Douch, E. J., army use of servomechanisms, (A) **4039**
Doucot, R., aging of copper oxide rectifiers, **755**
Doughty, E. G., with W. G. Worcester, mass spectrometer for leak detection, **2793**
Douglas, R. W., glass-to-metal seals, **1466**
Dow, O. E., with others, pulse time division radio relay, **3281**
Dow, W. G., transit-time effects in u.h.f. class C operation, **2290**
—— and H. W. Welch, resnatron, (A) **1224, 3348**
Downes, J. G., with G. L. Edgecombe, frequency doubler using Radiotron Type 807, **4084**
Dowsett, H. M., and L. E. Q. Walker, Handbook of Technical Instruction for Wireless Telegraphists, (B) **326**
Doxey, G. A., mass spectrometer vacuum leak detector, **2794**
Draper, C. R., metallization with Al, **2472**
Dreese, E. E., scale models of aerials, (A) **2011**
Dressel, R. W., with D. Rawcliffe, magnetic focusing and deflection in c.r. tubes, **303**
Dreyfus-Graf, J., ellipsoidal theory of wave propagation, **2058** ; quasi-optical links, **2545** ; waveform analysis of speech, [illegible]
Dreyfus-Pascal, C., frequency and pulse modulation, **874** ; vibrators, principles and applications, **892**
—— and R. Gondry, attenuators with linear response, **3838**
Drosdov, K. L., alphabetic series of mains valves, **2978** ; Russian valves, **2618** ; Western European valve code, **2977**
Drukarev, G., energy release in ionization of gases, **2071**
Duckworth, J. C., with G. E. Bacon, λ variation in waveguides, **1321**, (A) **1670**
Dudley, H., and O. O. Gruenz, Jr, phosphors for visible speech, (A) **3397**
Duerden, F., perfect *vs* pleasing reproduction, (D) **2554** ; wide-band dipole, **1010**
Dufay, J., and P. Flajolet, solar activity and variations of magnetic declination, **2089, 2090**
—— with others, solar activity and luminescence of earth's upper atmosphere, **3165**
Dumesnil, G., equivalent circuit for quartz plate in plane shear vibration, **2341**
Dumesnil, —, with others, quartz crystal equivalent circuit, **482**
Dummer, G. W. A., H_2S trainer, **1797**
—— and E. Franklin, radial time bases for radar, **3829**
Du Mont, A. B., relation of television to motion pictures, **912**
Dunajev, J. A., and B. V. Kurčatov, sulphide rectifiers, (A) **1828**
Dunbar, J. Y., with L. Green, Jr, disk-recording studio acoustics, (A) **2307, 3409**
Dunlap, W. C., Jr, Hall effect and magnetoresistance in Ge, (A) **3157**
Dunn, H. K., with others, sound spectrograph, (A) **3396**
Dunning, N. J., and H. D. Megaw, crystal structure of $MgWO_4$, **1462**
Dupouy, G., electron microscope, **496**
Durand, É., field due to moving electric charge, **392, 393** ; radiation field of linear sinusoidal oscillator, **356**
Durand, E., with others, temperature and pressure measurements in stratosphere, **2116**
Dutt, S. K., with M. M. Sengupta, Chapman's formula for E-layer ionization, **3903**
Dutta, A. K., magnetic anisotropy of molybdenite, **126**
Dyer, J. H., with F. Altmann, pulse-time multiplex broadcasting, **3657**
Dymond, C. W., with G. Wallin, v.h.f. tuner design, (A) **1026, 3265**

E

Eaglesfield, C. C., computer for linear simultaneous equations, (D) **1839** ; relation between transition time and pass band, **2034** ; transient response of filters, **48**
Eagleson, H. V., and O. W. Eagleson, identification of musical instruments, **3394**
Eagleson, O. W., with H. V. Eagleson, identification of musical instruments, **3394**
Eannarino, G., a.c./d.c. audio amplifier, **2369**
Early, H. C., waveguide, directional coupler for, **1007**, wattmeter for, **813**
—— and H. W. Welch, self-regulating field excitation for magnetrons, **1642**
Eastabrook, J., equivalent diode, **3545**
Easton, A., pentode oscillator, **2357**
Easton, E. C., and E. L. Chaffee, pulse-type valve tester, **1858**
Eastwood, M. J., with others, supplementary bibliography of electron microscopy, **1546**
Ebaugh, P., and R. E. Mueser, reciprocity calibration of underwater transducers, **3768**
Ebel, W. S., stratovision communication, (A) **1239, 3280**
Ebrall, H., electron characteristics, survey, **1734**
Eckersley, T. L., theory in development of u.s.w. propagation, **51**
Eddy, C. R., relativity, matter and energy relations, **388**
Eddy, W. N., and W. D. Fenn, h.v. d.c. testing of rubber-insulated wire, (D) **3180**
Edgecombe, G. L., and J. G. Downes, frequency doubler using Radiotron Type 807, **4084**
Edgerton, H. E., electrical discharge flashtubes for photography, **499**
Edinger, J. R., high-quality audio amplifier, **3835**
Edmundson, D., magnetic sheet steel, **3160**
Edson, W. A., with R. I. Sarbacher, Hyper and Ultrahigh Frequency Engineering, (B) **1300**
Edwin, I., crystal filters, **2701**
Edwards, A. W. J., design of constant-impedance equalizers, **664**
Edwards, D. V., and E. K. Smith, circuit cushioning of gas-filled rectifiers, **361**, (D) **3040**
Egan, J. P., and F. M. Wiener, speech intelligibility in noise, **335**
Egan, W. G., electroencephalograph technique, **1650**
Egerton, L., and D. A. McLean, paper capacitors, containing chlorinated impregnants, (A) **654**
—— with others, paper capacitors, containing chlorinated impregnants, **655**, (A) **2811**
Ehrenhaft, F., motion of particles in magnetic field, **2755**
Ehret, R. J., television aerial systems, **3029**
Ehrlich, R. W., audio oscillator, **622**
Einberg, A. A., with Ya. L. Al'pert, ionosphere recombination coefficient, **3109**
Eisenberg, P., and H. A. Chinn, broadcast listeners' preferences, (D) **612**
Eisenstein, A., barium silicate interface of oxide-coated cathodes, (A) **3158** ; oxide cathode coatings, **945**
—— with A. Fineman, interface of oxide cathodes, **946**
Eklund, E., carrier-current telephone systems, **531**
Eklund, S., with H. Alfvén, h.v. measurement, **1859**
Electronics, aerials for circularly polarized waves, **1009** ; airborne radar specifications, **1806** ; apartment television aerials, **2955** ; buzzer signal generator for 3000 Mc/s, **57** ; Cs vapour modulated-arc lamp, **900** ; developments and applications of electron accelerator, **1539** ; Edvac, mercury memory tank, **2828** ; electronic colour television, **1240** ; electronic heating conference, **972** ; electronic micrometer for thin materials, **197** ; electronic mine fuses, **201** ; facsimile over 4000 Mc/s relay system, **265** ; f.m. guillotine tuner, **2052** ; frequency allocation, F.C.C., **3653** ; high speed counter, **827** ; magnetic sound for amateur movies, **2322** ; microwave relay system, **2576** ; microwave wattmeter, **814** ; mobile communication for power-line servicemen, **883** ; opinion meter, **1533** ; projection television, patented systems, **914** ; pulse time modulation circuits, **875** ; radarange for cooking, **838** ; radar-guided bomb, **1100** ; radioactive infra-red detector, **198** ; radio-beam aircraft speedometer, **215** ; reactance comparator, **804** ; remote cloud indicator, **208** ; skiatron for p.p.i. display, (A) **302** ; supersonic applications, **2311** ; television system for industrial applications, **2953** ; u.h.f. power valves, **2976** ; v.h.f. multichannel systems, **234** ; water-jet analogue of klystron, **1648** ; WWV standard frequency transmissions, **2849** ; 2500-ft vertical aerial, **2677**
Elenbaas, W., high-pressure discharges, **3500**
Eley, D. D., structure of catalytic metal films, **435**
Eliezer, C. J., classical electron motion equations, **72** ; electrons and Dirac's quantum electrodynamics, **389**
Ellickson, R. T., and W. L. Parker, infra-red sensitive phosphors, **1459**
Elliott, W. H., electronic speed control of a.c. motors, (A) **1154, 3213**
Ellis, A. B., and J. P. Gilmore, public address system for large outdoor arena, **994**
Ellithorn, H. E., maximum power transfer, **369**
Ellyett, C. D., D layer echoes in Pacific, **3122**
Elsasser, W. M., geomagnetic induction effects, **98**
Elson, N., rectangular waveguides with discontinuities, **1669**
Emery, W. L., Ultra High-Frequency Radio Engineering, (B) **610**
E.M.I. Laboratories, h.v. measurement by c.r. tube, **3178**
Emms, E. T., transient response of filters, (D) **662**, (D) **2348**
Emrich, R. J., spiral chronograph for millisecond intervals, **3569**
Endall, R., sweep frequency signal generator, **3199**
von Engel, A., with E. W. B. Gill, low-pressure electrical discharges, [illegible]
Engel, J. S., mobile ground radar for landing aircraft, **3911**
Engleman, C. L., with D. G. Fink, electronics at Bikini, **837**
Épelboim, I., ferromagnetic materials in weak a.c. fields, **797**
Epstein, L. F., W. M. A. Andersen and L. R. Harden, supersonic power output of quartz crystal, **2442**
Epstein, P. S., radio wave propagation, Sommerfeld's theory, **4007**
Erdélyi, A., and J. Todd, advanced practical mathematics, **1490**
Ergen, W. K., bridge-type electrical computers, (A) **2165**
Ericson, H. L., with others, noise reduction in aircraft, **3405**
Ernst, P. J., ultrasonic lenses, measurement and specification, **3391**, and transmission plates, (A) **2307**
Ertaud, A., with others, first-order elements of e.s. lenses, **835**
Esclangon, F., frequency meter, **2503**
Espersen, G. A., uses of Zr in valves, **1120**
Essen, L., Doppler effect in propagation, (D) **4008** ; velocity of e.m. waves, **3249**
Eurich, J. V., Electrotors, small d.c. motors, **3291**
Evans, G. R., and T. C. Griffiths, slow mesons at sea-level, **3513**
Evans, R., with others, counting rate meter, **1150**
Evans, U. R., corrosion processes, **3159**
Evans, W. E., Jr, with others, meteor detection by radio, **1417**
Everett, L., f.m. broadcast transmitters, **4060**
Everhart, J. O., with M. Lassettre, stress-strain relations in ceramic materials, **453**
Ewing, D. H., and R. W. K. Smith, teleran, (A) **1089, 3138, 3139**

F

Fagan, C. P., electrochemical recording, **2952**
Faick, C. A., with R. Stair, infra-red absorption spectra, **3540**
Fairhurst, H. A., noise suppression in television receiver, **274**
Falls, W. H., Se and CuO rectifiers, **2581**
Familier, V., with D. Glazer, matching ranges of transmitters, **1958**
Fanchamps, F., valves and their industrial applications, **2880**
Fanker, E. M., and R. A. Ratcliffe, f.m. v.h.f. receivers, testing procedure, **2912**
Farren, L. I., phase detectors, **474**
Farrington, G. H., theory of process control, (A) **4039**
Fasal, J., stroboscopic study of loudspeakers, **617**
Faust, C. L., electropolishing, (A) **1831**
Faust, F. H., with others, progress in engineering knowledge in 1946, **2996**
Faust, W. R., and H. M. Beck, *n*-stage amplifier oscillation conditions, **677**
Favre, M., with E. Guyer, 10-kW telegraphy transmitter, **1615**
Federal Communications Commission, f.m. radio stations, engineering standards, **542**
Federal Telephone and Radio Corporation, Reference Data for Radio Engineers, (B) **1302**
Fedorus, G. A., with others, metal-semiconductor contact potential, **1816**
Feenberg, E., debunching in v.m. system, **1272**
—— and D. Feldman, electron bunching in rectangular section beam, **1627**
Feiker, G. E., standing-wave indicator, **182**
—— and H. R. Meahl, direct reading u.h.f. wavemeters, **3589**
Fein, E., stopping power of Pb and Al for mesotrons, **720**
Feinberg, E. L., coastal effect in d.f., **2428** ; e.m. propagation along earth's surface, **1902**
Fejér, G., and P. Scherrer, waveguide measurement of dielectric constants, **2486**
Feldman, D., with E. Feenberg, electron bunching in rectangular section beam, **1627**
Feldman, K., with W. Hushley, portable G-M counters, **3977**
Feldmann, P., interstage auto-transformer, **1027**
Feldt, R., long persistence c.r. tube screens, **123**
—— and C. Berkley, c.r. spectrograph, (A) **1154, 3219**
Félix, M., electronic welding equipment, **3991**
Felton, A., with R. S. J. Spilsbury, millisecond chronoscope, (A) **1137**, (A) **3964**
Felvašnikova (Felvashnikova), S. P., with others, metal-semiconductor contact potential, **1816**
Fenn, W. D., with W. N. Eddy, h.v. d.c. testing of rubber-insulated wire, (D) **3180**
Ferguson, A. J., phase correction in delay networks, **2031**
Ferguson, J. D., electrical engineering progress, (A) **3370**
Ferguson, J. G., with others, microwave radar testing, **478**
Ferraro, V. C. A., diffusion in ionosphere, **415**
Ferrell, E. B., electrical and mechanical analogies, **969**
Ferrell, O. P., solar noise during radio fade-outs, **486** ; sporadic-E layer, **2770**
Ferrier, D. T., and W. G. Baird, Jr, kytoon for erecting aerials, **87**
Feshbach, H., and C. M. Harris, non-uniform wall material and room acoustics, **342**, (A) **3764**
—— with L. Lax, radiation distribution of cylinder vibrating at high frequencies, **3750**
Fetherston, N., and L. W. Cranch, powder metallurgy and radio engineering, **2818**
Feynman, R. P., and H. A. Bethe, analysis of cosmic-ray phenomena, (A) **1437**
Field, L. M., high current electron guns, **1967**, (A) **4076**
—— K. Spangenberg and R. Helm, electron-beam dispersion at high vacuum, **3849**
—— with J. R. Pierce, travelling-wave valves, construction, **2285**
—— with others, cathode design for electron beam tubes, **4071**
Fielding, T. J., plastics in electrical industry, **1835**
Fields, C. V., and C. L. Cadwell, porcelain insulators at high altitudes, **442**
Findlay, J. W., changes of phase-paths of radio waves in ionosphere, **2114**
Fineman, A., and A. Eisenstein, interface of oxide cathodes, **946**
Fink, D. G., sequential *vs* simultaneous colour television, **1602**
—— and C. L. Engleman, electronics at Bikini, **837**
—— and T. D. Hanscome, electronics in atomic bomb tests, **1892**
Finke, H. E., modern magnetic materials, **3937**
Finnimore, T. C., and W. D. Mallinson, naval fire-control radar design, **1801**
Fisher, H. J., with others, microwave radar testing, **478**
Fisher, J. R., with others, photocell using photoconductive Si, **1961**, (A) **4064**
Fisk, J. B., H. D. Hagstrum and P. L. Hartman, magnetron for cm λ generation, **293**
Fiske, M. D., resonant windows for vacuum seals in waveguides, **1231**
Fitch, E., with others, diversity reception, **1920**
Fitzgerald, J. W., M. E. Davis and B. G. Hurdle, acoustic effects of marine fouling, **3399**
—— with others, propagation of pressure waves in Hg at 100 to 1000 Mc/s, **3755**
Fitzpatrick, H. D. N., with others, diffusion from plane surface, **3494**
Flajolet, P., with J. Dufay, solar activity and variations of magnetic declination, **2089, 2090**
Fleming, J. A., work of Department of Terrestrial Magnetism, **1751**
Fleming, L., thermistor-regulated l.f. oscillator, **195**
Flory, L. E., with G. A. Morton, infra-red image tube and military applications, **2861**
—— with V. K. Zworykin, electronic reading aid for the blind, **3229**
Fluke, J. M., and N. E. Porter, developments in infra-red communications components, **1230**
Fock, V. A., currents induced by plane wave on surface of conductor, **1412** ; diffraction of radio waves round earth, **846, 2891** ; field of plane wave near conducting body, **2081** ; propagation and dispersion of radio waves, **2890**
—— with M. Leontovich, e.m. propagation along earth's surface, theory, **1901**
Foix, A., propagation of light waves, **689**
Foldy, L., and D. Bohm, efficiency of f.m. cyclotron, (A) **1163**
—— with D. Bohm, theory of synchrotron, **1542**
Foldy, L. L., with E. L. Carstensen, propagation of sound through liquid containing bubbles, **3388**
—— with H. Primakoff, electroacoustic transducer theory, **1990**
Foltz, L. S., circuit constants, derivation from oscillograms, **473**
Fonda, G. R., ZnS infra-red sensitive phosphors, **122**
Foote Mineral Co., uses of Zr in valves, **1120**
Forbush, S. E., cosmic ray increases and solar charged particles, **1438**
Ford, G. T., valves for radar i.f. amplifiers, **937**
Ford, J. R., and N. I. Korman, stability and frequency pulling of unstabilized oscillators, **667**
Ford, L. H., magnetron with series field winding, **2631**, (A) **3349**
—— with J. S. McPetrie, u.s.w. propagation, over bare ridges, (A) **509**, over land, and effect of obstacles, (A) **511**
—— with J. A. Saxton, dipole reflector insulation, **357**
de Forest, L., survey of papers, **2998**
Forgue, S. V., with others, mimo, miniature image orthicon, **2959**
Forman, J., and D. J. Crisp, absorption spectra of solutions of electrolytes, **2731**
Forrester, A. T., with E. Gerjuoy, thermal noise for low-temperature thermometry, **2863**
Forster, E. W., and L. C. Ludbrook, industrial servo and regulator systems, (A) **4039**
Forsyth, J. S. A., with W. Jackson, power factor of polythene, **2145**, (A) **3161**
Foster, A. W., with others, automatic control in chemical industry, (A) **4039**
Foster, H. G., load conditions in class A triode amplifiers, **1044**
—— with others, gyro interaction of radio waves, **2897**
Fournier, A., transmission lines as resonant circuits, **3424**
Fouty, R. A., models for radiation pattern measurements, (A) **2011**
Fowler, N. B., measurement units and scales in communications, **2508**
Fox, F. E., K. F. Herzfeld and G. D. Rock, supersonic waves and conductivity of salt solutions, **1397**
Fox, L., differential equations, relaxation methods, **3565**
Frachebourg, C., invention of telephone, controversy, **602**
Francis, E. H., moving-iron pickups, **3759**
Francis, J. E., Jr, with others, fast coincidence circuit with pulse height selection, (A) **3805**
Franck, J. C., with others, synchrotron r.f. system, (A) **1165**
Frank, F. C., mathematical representations of polar molecules in crystals, **2739** ; theories of dielectric constants of concentrated polar media, **2738**
Frank, I., and V. Ginsburg, radiation from electron passing from one medium to another, **2402**
Frank, J. M., W. S. Huxford and W. R. Wilson, modulation of Cs arc, (A) **4023**
Frank, N. H., stability of electron orbits in synchrotron, **494**
Frankel, S., equations for generalized transmission lines, **2004**
—— J. J. Glauber and J. P. Wallenstein, 600-Mc/s triode, **1635**
Franklin, E., with G. W. A. Dummer, radial time bases for radar, **3829**
Franklin, R. F., interlaminar resistance of magnetic cores, **2170**
Frans, K., aerials, survey, polar diagrams, **1333**
Fraser, I. S., A. A. Read and B. E. Vieyra, electrical engineering aspect of degaussing, **842**
Fraser, L. W., and others, cosmic rays, methods of V-2 rocket tests, (A) **3882**
Fredendall, G. L., K. Schlesinger and A. C. Schroeder, single carrier television, (D) **2263**
—— with others, colour television system, **2958**
Frederick, C. L., radio telemetering for dynamic testing of aircraft in flight, **2872**
Free, A. L., with G. F. Barnett, photoelectric dust meter, **1536**
Freedman, N. S., glass-to-metal seals, **3918**
Freedman, S., generating microwaves, **2710**
Freeth, F. A., polythene, survey and applications, (A) **1487** ; properties of various insulating materials, **2474**
Frelich, P. D., self-oscillation prevention in tetrode amplifiers, **58**
Fremberg, N. E., Riesz potential and e.m. and meson field theories, **1411**
Fremlin, J. H., velocity modulation, **3352**
—— R. N. Hall and P. A. Shatford, triode amplification factors, **2821**
French, N. R., and J. C. Steinberg, factors governing speech intelligibility, **1979**
—— with J. C. Steinberg, portrayal of visible speech, (A) **3395**
Frenkel, J., atmospheric electricity and lightning, **3906** ; electrical contacts between metals, theory, **1069** ; thundercloud electrification, theory, **1783** ; water drops and ionization and electrification of air, **1449**
Freres, C. H., with others, cm λ attenuation in rain, (A) **1181, 2553**
Fretter, W. B., mass of meson, **1429**
—— and R. B. Brode, mass of meson, (A) **1430**
Freudon, P. J., Bedford television system, **1601**
Frey, H. A., and L. N. Tessarko, breakdown of ceramic dielectrics at high temperatures, **2810**
Frey, W., Nyquist and Leonhard stability criteria, **2022**
Fricke, R. E., with D. W. Atchley, Jr, direct reading modulation meter, **1864**
Friedlaender, E. R., permeability of dust cores, (D) **3163**

Friedlander, F. G., dielectric-lens aerial for wide-angle beam scanning, 1358, (A) 1682 ; diffraction of sound pulses, 3
Friedman, H., with I. H. Blifford, voltage stabilization by corona discharge, (A) 3983
—— with C. O. Muehlhause, G-M counter for high counting rates, 1876
Friend, A. W., powdered iron in television deflecting circuits, (A) 1239, 3305, 3306
v. Friesen, S., and S. Lenander, relative intensities in electron diffraction diagrams, 1867
Friis, H. T., radar reflections from lower atmosphere, 2769
—— and W. D. Lewis, radar aerials, 3796
Frisby, H., with P. Renaud, electron diffraction by electrolytically polished copper, 768
Frischmuth, B., current creep with artificial insulating materials, 3932
—— with others, dielectric and mechanical properties of organic layered insulating materials, 1474
Fritsch, V., geophysical prospecting, survey of methods, 1524; radio communication in mines, 2217 ; radio prospecting, 216
Frocht, M. M., numerical solution of Laplace's equation, 785
Fröhlich, H., dielectric theory, 124 ; dipolar interaction, 2734 ; energy and stability of electrons in electric fields, 2391 ; theory of dielectric breakdown in solids, 2405
Froome, K. D., current growth in arc discharges, 2408
Frost, A. A., contact potential difference measurement, 471
Fry, W. J., with others, underwater sound propagation at l.f., (A) 2307
Fuchs, G., coaxial cable impedance measurement, 1848 ; impedance irregularities in coaxial pairs, 3782
Fulcher, G. S., interpolation by first differences, 153
Fuller, C. S., synthetic rubber research, 454
Fundingsland, O. T., and G. J. Wheeler, constant current circuits, [illegible]
Furry, W. H., mesotron mass, (A) 3882 ; phase integral methods, 3095
Furst, U. R., wow, causes and measurement, 990
Fürth, R., and D. K. C. MacDonald, spontaneous fluctuations, statistical analysis, 4089
—— with D. K. C. MacDonald, spontaneous fluctuations in valves, [illegible]

G

Gabor, D., particle accelerators, stabilization by grid lenses, 2882 ; theory of communication, 1057, (A) 1729 ; theory of hearing, (A) 3003
Gadwa, T. A., tuned-line matching transformer, 624
Gaffney, F. J., microwave measurements and test equipment, survey, 800
Gaillard, S., air-to-ground communication system, 887
Gaines, W. L., c.r. oscilloscope design, (A) 1258, (A) 3191
Gainsborough, G. F., calibration of signal generators and r.f. attenuators, 3202, (A) 3972
Gairdner, J. O. H., naval use of servomechanisms, (A) 4039
Gale, D. I., with others, temperature and pressure measurements in stratosphere, 2116
Gall, D. C., and F. C. Widdis, high-impedance a.c. voltmeter, 1514, (D) 3583
Gallagher, C. J., with J. D. Cobine, hot-cathode arcs, oscillations, 1406, oscillations and noise in, 2400 ; noise in gas valves, 2401
Gallup, J., electrolysis in glass stems of rectifier valves, 447
Gamble, E. H., thermionic diodes, h.f. response, (A) 4074
Gammon, P. W. J., band-switched exciter, 3469
Gane, P. G., with B. F. J. Schonland, lightning warning device, 3987
Ganguli, D. K., with others, location of thunderstorm centres, 3132
Ganz, A. G., thin permalloy tape in h.f. transformers, (A) 3162
Ganz, E., dust ring-core coils, 1685
—— with G. Busch, dielectric measurements on KH$_2$PO$_4$ and KH$_2$AsO$_4$ at low temperatures, 2451
Gardner, M. B., pulse-tone technique for hearing tests, 3761
Garlick, G. F. J., and A. F. Gibson, dielectric changes in phosphorescent solids, 2444 ; luminescence processes in ZnS phosphors, 1104
Garner, W. R., auditory thresholds of short tones, 3762
Garr, D. E., electrical positioning system, 4004
Garratt, G. R. M., whistling meteors, 2407
Garton, C. G., capacitors for measurement, 481 ; distribution of relaxation times in dielectrics, 2799
Garvin, S. J., sintered permanent magnets, 3553
Garwick, J. V., r.f. solar radiation, theory, 1758, 2087
Gavin, M. R., interference from industrial electronic apparatus, (AD) 2230
—— and G. W. Warren, deflected-beam valves for u.h.f., 936
Gawith, A. H., load-bearing properties of soil, 102
Gecks, F. H., with others, propagation of short a.m. and f.m. waves, 2236
Gehres, F., with H. Kees, cavity aircraft aerial, 1346
Genishta, E. N., battery-operated receiver, 2560
Genkin, D., control in spot welding, 1896
Gent, A. W., and P. J. Wallis, impedance matching of tapered transmission lines, 1381
George, E. F., electron collision frequency in upper atmosphere, 2420
George, K. P., with H. Cary, sensitive high-speed radiation thermocouple, (A) 2643
George, W. D., M. C. Selby and R. Scolnik, electrical characteristics of quartz crystal units, 3574
Gerhart, P. L., technical educational requirements of modern radio industry, 4090
Gerjuoy, E., and A. T. Forrester, thermal noise for low-temperature thermometry, 2863
Gerlach, G. G., microwave relay communication system, (A) 1217, [illegible]
Gerlicher, H. W., extending thyratron life, (A) 951
Germeshausen, K. J., and R. S. John, gramophone pickup using strain gauge, 613
Gerould, C. H., silica replicas for electron microscopy, 3615
Getting, I. A., proposed detector for high-energy electrons and mesons, 2394
—— with others, electron beam displacement in synchrotron, 832
Gevers, M., power factor and temperature coefficient of solid dielectrics, 125, 1476, 3548, 3572, 3929
—— and F. K. du Pré, power factor and temperature coefficient of solid amorphous dielectrics, 2798
Geyer, B. H., Jr, modulator for low power, 675
G.G.C. Development Co., electronic relay, 488
Gherghi, M., with others, interaction of waves in ionosphere, 513
Gherzi, E., ionosphere reflections and weather forecasting for Eastern China, 2771
Ghosh, A., betatron, 833
Ghosh, S. K., with N. N. Das Gupta, Wilson cloud-chamber applications, 79
Ghosh, S. N., night sky light at Calcutta, 2776 ; nocturnal variations in E- and F-layer heights, 727
Giacoletto, L. J., multitone a.m. and f.m., theory, 3700
Giao, A., magnetism of rotating masses, 3892
Gibault, G., geomagnetic disturbance of 28th March 1946, 725
Gibbs, D. F., and W. A. H. Rushton, wide-range linear timebase, 1711
Gibbs, L., with others, coding radiosonde, (A) 3984
Gibbs, N., L. Gibbs and E. W. Pike, coding radiosonde, (A) 3984
Gibson, A. F., with G. F. J. Garlick, dielectric changes in phosphorescent solids, 2444 ; luminescence processes in ZnS phosphors, 1104
Giesecke, A. A., with others, ionosphere and solar eclipse of Jan. 1944 at Huancayo, 503
Gilbert, J., ionic equilibrium in lower atmosphere, 2120
Gilbert, R. W., stable voltmeter, 2500
Gill, E. W. B., and A. von Engel, low-pressure electrical discharges, 2749
Gill, P. S., meson production at 30000 ft height, 2418
—— with others, mesons, latitude effect up to 35000 ft, (A) 3882
Gill, R., site and field strength surveys for broadcasting stations, 1934
Gilloux, H., frequency standard, 1144
Gilly, J., finite parts of integrals and Laplace-Carson transformation, 1492
Gilman, G. W., H. B. Coxhead and F. H. Willis, reflection of sound signals in troposphere, 330, (A) 3751
Gilmore, J. P., with A. B. Ellis, public address system for large outdoor arena, 994
Gilmour, N. S., f.m. and television, 2931
Gilmour, R. R., CuO rectifier for voltage doubling, 2025
Giniaux, G., components and accessories, 1947 Salon, Paris, 2377 ; measurement apparatus at 1946 Paris Fair, 1138 ; Paris Fair 1947, 4097
Ginzbarg, A., with others, Purdue microwave electron accelerator, (A) 1540
Ginzburg, V. L., dielectric properties of BaTiO$_3$ and of ferroelectric crystals, 1472 ; short-circuiting charged transmission line, 3448
—— with I. Frank, radiation from electron passing from one medium to another, 2402
Girard, J. M., dry rectifiers, applications and production, 894, 1489, (D) [illegible]
Giroud, P., Decca navigator, 2430
—— and L. Couillard, radio altimeter for aircraft, 3912
Gitzendanner, L. G., electronics in measurement, 3994
Givens, M. P., and J. S. Saby, parallel-T null network, 3452
—— with others, supersonic propagation in open air, 1939
Gladwin, A. S., class-B amplifiers, 385
—— with P. G. M. Dawe, phase-shift oscillators, 2355
Glaser, A., glow discharge tubes for measurement, 191
Glauber, J. J., transmitting valves for pulsed and c.w. operation, 2288
—— D. D. Grieg and S. Moskowitz, cyclophon, beam switching tube, (A) 1258
—— with others, 600-Mc/s triode, 1635
Glazer, D., and V. Familier, matching ranges of transmitters, 1958
Gleadle, G. H. M., iron-dust cores, 2816
Gleason, J. M., steatite for h.f. insulation, 189, 2811
Gleissberg, W., reality index for cyclic variations, 1496, (D) 2829
Glinski, G., s.w.r. meter for v.h.f., 3201
Glover, C. P., and K. S. Van Dyke, variations in crystal quartz, (A) [illegible]
Godley, P., and J. C. Balsbaugh, metallized capacitor tests, 3175
Goggin, W. C., and R. F. Boyer, dielectric applications of plastics, [illegible]
Goldberg, H., internal impedance of cathode follower, (D) 2023
—— and C. C. Bath, multiplex with pulse-time and pulsed f.m., (A) 3278
Goldman, S., with H. E. Hallborg, radiation angle variations, 3625
Goldmark, P. C., colour television developments, (A) 1239
Goldschmidt, R., dielectric investigations on polymer fluids, 1830
Goldsmith, A. N., and others (Eds), Television, Vols. 3 and 4, (B) 3320
Goldstein, H., frequency characteristics of sea echo, 2213 ; radar echoes from shell splashes and sea spray, 423
Goldsztaub, S., high-intensity point-focus X-ray tube, 2203 ; observation of electron images, 2187
Golian, S. E., and E. H. Krause, cosmic-ray experiments with V-2 rocket, 3512
—— E. H. Krause and G. J. Perlow, cosmic radiation at great heights, 94
—— with E. H. Krause, cosmic rays, V-2 rocket tests, (A) 3882
Gondet, H., electrical measurement of mechanical quantities, 824
Gondry, R., high-fidelity receiver, 2910
—— with R. Aschen, Principes de l'Oscillographe cathodique, (B) 1234
—— with C. Dreyfus-Pascal, attenuators with linear response, 3838
Good, W., A. Kip and S. Brown, design of β- and γ-ray G-M counters, 484
Good, W. E., inversion spectrum of ammonia, 69
—— and D. K. Coles, microwave absorption of NH$_3$, (A) 3868, of N^{14}H$_3$ and N^{15}H$_3$, 3097
—— with D. K. Coles, microwave spectroscopy, Stark and Zeeman effects, (A) 3867
Goode, J. T., distortion analyser, 2499
Goodman, B., l.f. narrow-band f.m. and phase modulator, 3327
—— A. W. Lawson and L. I. Schiff, thermal ionization of impurity levels in semiconductors, 2453
—— with others, 1-kW transmitter, 3.5–30 Mc/s, 3326
Goodman, M. M., with R. E. Barrett, simplified television system, 3683
Gootée, T., ring oscillators for u.h.f. transmission, 1623
Gorham, J. E., U.S. valves in the war, 2620
Görner, J., circuits for voltage differentiation, 30
Gorodetzky, S., P. Chanson and H. Denamur, cosmic-ray showers, 1768
Gorozhankin, B. N., with Ya.L. Al'pert, radio observations in solar eclipse of 9th July 1945, 2093
Gorshunov, V. N., synchronization range of television synchronizing generator, 4049
Goucher, F. S., and others, spark gap switches for radar, 899
Goudet, G., and J. Lignon, guided waves in coaxial line, 2665
Gougel, V. M., effect of impurities on ZnS phosphors, 1814
Gould, C. D., subminiature electrometer valve, 2626
Gourod, G., dielectric heating, 3224
de Gouvenain, A., ionospheric propagation and s.w. links, 1211 ; u.s.w. propagation, survey, 852
Gouveritch, J., iron dust cores at v.h.f., 1119
Goward, F. K., and D. E. Barnes, synchrotron for electron acceleration, 834
—— and J. Dain, synchrotron beam ejection, 3232
—— with A. L. Cullen, slot aerial array for given radiation pattern, [illegible]
Graber, R. E., with C. R. Smitley, electronic switch for pulse production, 3047
Graham, R. C., solid dielectric r.f. transmission lines, 351
Graham, R. E., servo theory, 890
Grammer, G., suppression of harmonics, 984
—— D. Mix and B. Goodman, 1-kW transmitter, 3.5–30 Mc/s, 3326
Granovsky, B., and L. Bykhovskaya, oscillations in low-pressure arc discharge, 2067
Grassot, P., c.r. oscillographs for transients, 3587 ; theory of quadripole between source and dipole, 660
Graves, A., G-M counter circuits, 1364
Graves, H. K., with A. Rufolo, dielectric strength of varnished cambric, 760
Gray, S. M., with L. E. Shorey, interference from fluorescent lamps, (A) 2231, 2571
Green, A. L., early history of ionosphere, 1775 ; superheterodyne tracking charts, 3830
Green, C. B., with others, properties and uses of thermistors, 768, 3552
Green, E., frequency instability of self-oscillators, 2767 ; linear amplifier design for single-sideband transmitters, 3704
Green, E. I., H. J. Fisher and J. G. Ferguson, microwave radar testing, 478
Green, L., Jr, and J. V. Dunbar, disk-recording studio acoustics, (A) 2307, 3409
Green, N. H., miniature valves, 3720
Green, R. L., with L. Navias, dielectric properties of glasses at u.h.f., 452, (A) 1114
Greenblatt, M. H., and P. H. Miller, Jr, electron multiplier, (A) 3976
Greene, G. G., f.m. aerial using waveguide principle, 3798
Greenspan, M., with others, thermal voltage of quartz crystal, (A) 3848
Greenstein, J. L., with G. Reber, cosmic and solar r.f. radiation, 1757
Gregg, E. C., Jr, a.c. probe for measurement of magnetic fields, (A) 3184, 3579
Greig, J., e.m. radiation, 2754 ; post-graduate electrical engineering courses, (D) 600
Greinacher, H., simplified spark counter, 2866
Grieg, D. D., and A. G. Kandoian, u.h.f. pulse time multiplex broadcasting, (A) 1217
—— and A. M. Levine, p.m. multiplex relay system, 1213
—— and S. Moskowitz, multiplex u.h.f. broadcasting, 3277
—— with S. Moskowitz, p.m. noise suppression, (A) 3269
—— with others, cyclophon, beam-switching tube, (A) 1258
Grieser, T. J., with others, multichannel microwave radio relay system, 1219, (A) 4032
Griffiths, H. A. H., vacuum capacitors, 1020
Griffiths, H. V., Doppler effect in propagation, 3254, (D) 4008
Griffiths, J. H. E., anomalous h.f. resistance of ferromagnetic materials, 747
Griffiths, T. C., with G. R. Evans, slow mesons at sea-level, 3513
Grignon, L. D., three-band variable equalizer, 1316
Grigor'eva, A. A., solar eclipse of 9th July 1945 and wave propagation, 2411
Grimm, G. O., weathering of thermosetting plastics, 1469
Grindley, E. N., earth's magnetic field in S. Africa, July 1930, 2768
Grisdale, G. L., and R. B. Armstrong, communication receiver design, 223, (A) 1189
Grisdale, R. O., with M. D. Rigterink, porcelains with low dielectric loss, 3550
Grivet, P., cavity resonators, natural wavelength, 2041, vibrations in, 2040 ; electron microscope, 3611, C.S.F. e.s., 1167
—— and H. Bruck, C.S.F. e.s. electron microscope, 1166
de Groot, W., ZnS phosphors, dielectric properties, (A) 3148
Grosdoff, I. E., electronic counters, 2695
Groshev, L., with others, penetrating showers in cosmic rays, 1440
Grosvenor, G., cosmic rays, research in aircraft, 3110
Grover, C., notable electrotechnical forecasts, 313
Grover, F. W., Inductance Calculations, (B) 1055
Groves, L. G., and J. King, moisture content of cereals by permittivity measurement, 825
Gruenz, O. O., Jr, with H. Dudley, phosphors for visible speech, (A) 2297
Grünberg, G. A., boundary problems, in equations of mathematical physics, 2479, methods of solution of, 1838
Guanella, G., carrier stabilization in f.m. transmitters, 1614 ; survey of various radar systems, 1795
Gucker, F. T., Jr, sensitive photoelectric photometer, 3995
Guelke, R. W., and C. A. Schoute-Vanneck, measurement of sea-water velocity by induction, 3602
Guénard, P., energy exchange between electron beam and weak magnetic field, 2989 ; lens effect of a.c. fields on v.m. valves, 955 ; two-cavity klystrons, 2991, power and efficiency of, 2992
Guerrier ,L., h.f. traction, 1153
Guilland, C., ferromagnetic properties of MnNi$_3$ and Fe$_3$C, 2138
—— and H. Creveaux, preparation and magnetic properties of Fe$_4$N, 131
Guillemin, E. A., incidental dissipation in filters, 49
Guindin, D., theory of valve oscillators, 1380
Guinier, A., with J. Devaux, X-ray absorption coefficient measurement, [illegible]
Gundlach, F. W., transit-time oscillations, 3468
Gunn, A. F., and R. A. Scott, measurement of thickness of thin films, 867
Gunn, R., precipitation static and thunderstorms, 2425
—— with J. E. Dinger, electrical effects with change of state of water, 1780
Gurevich, L., thermoelectric properties of conductors, 3498
—— and A. Lebedinsky, magnetic field of sunspots, 1761
Gurewitsch, A. M., and J. R. Whinnery, microwave oscillators using disk-seal valves, 2709
Gürgen, K., with others, G-M counter, 1145
Gurin, H. M., with G. M. Nixon, criteria for studio design, (A) 2307, 3411
Guth, E., with others, rubber, with carbon black, electrical conductivity, 3557, dielectric properties, (A) 3167
Guthrie, C. F., radiation chart for f.m. stations, 3682
Gutmann, F., measurement of dynamic mutual conductance of valves, 3576
Güttinger, P., f.m. signal distortion by band-pass filters, 1698 ; modulation systems, 1583 ; p.m. principles, 1933 ; theory of frequency discriminator, 1384
Gutton, C., photoelectric effect and corpuscular theory of light, 1398
Gutton, H., cm λ projectors, 1622
Guy, J. A., with W. N. Christiansen, 8-wire transmission line, 3753
Guy, R. F., television as a public service, (A) 3300
Guyer, E., and M. Favre, 10-kW telegraphy transmitter, 1615
Guyer, E. M., h.f. heating for glass working, 1156
Guyot, —, with — Chamagne, microphony of valves, 3339
Gvozdover, S. D., h.f. currents in electronic apparatus, 579 ; reflex klystron, self-excitation, 3740, theory, 587 ; self-excitation of electrical systems, 1703
—— and V. Lopukhin, self-excitation of cavity resonator, 3461 ; single-circuit klystrons, theory, 1647 ; theory of monotron, 956
—— with L. N. Losbakov, theory of single-circuit klystron, 3739
György, S., luminescent materials, 2795

H

Haas, F., electronic switch, 1151 ; portable valve tester, 1509 ; routine testing by c.r.o., 809 ; signal tracer, 856
Hadfield, D., permanent magnet design, 2461
Hadlock, C. F., 2-m superheterodyne receiver, 2223
Haefely, G., plastics in electrical industry, (A) 2161
Haeff, A. V., minimum detectable radar signal, 1095
Haefner, S. J., and R. H. Smith, standard frequency generator, 2858
Hagemann, E. C., resistance networks for gun-laying computer circuits, 1022
Hagstrum, H. D., generators for cm λ, 3347
—— with others, magnetron for cm λ generation, 293
Hague, B., Alternating Current Bridge Methods, (B) 196
Haine, M. E., electron microscope, (A) 2529, electron optical system of, 3612
Hainer, R. M., with G. W. King, microwave absorption of HDO, (A) 2396
—— with others, microwave absorption of water and related molecules, 3898
Haines, R. S., with others, effect of adsorption on activated carbon, 2083
Haist, C. T., mobile 10-m transmitter, 2968
Hale, N., with W. Bruene, amateur band transmitter, 927
Hale, N. B., with J. W. Smith, speech clipping and filtering, 332, for increased intelligibility, 336
Hale, V. C., 4-element aerial array, 2336
Hall, A. A., servomechanisms in aircraft, (A) 4039
Hall, A. C., circuit theory and design of servomechanisms, 1016
—— with G. S. Brown, design and behaviour of servomechanisms, 246
Hall, H. J., impulse corona in air, (A) 3655
Hall, H. W., and others, dielectric absorption of solutions, 2839
Hall, N. I., SL radar, 425
Hall, R. N., with others, triode amplification factors, 2621
Hallborg, H. E., and S. Goldman, radiation angle variations, 3625
Halliday, D., with others, paramagnetic resonance absorption of salts at 9600 Mc/s, (A) 3866
Halliday, I. G., with others, dielectric absorption of solutions, 2839
Halligan, B., and C. Read, receiver using split-stator circuit, 522
Hallman, L. B., Jr, with R. D. Hultgren, theory and application of radar beacons, 3533
Hallmark, C. E., counter timer for television, (A) 3302
Hallows, R. W., automatic receiver production, 4010 ; miniature spot-welding tools, 551 ; radar developments in Great Britain, 1098
Halls, E. E., Cd as plating material, 778, (D) 779 ; electroplated finishes under humidity tests, (D) 2157
Hamacher, E. A., cyclotron beam current integrator and recorder, 1886
Hamburger, G. L., permanent magnet design and applications, (D) 2148 ; universal c.r.o., 1948

Hamermesh, B., with S. A. Korff, cosmic radiation, and nucleons, **3515**, production of neutrons by, **1427**
Hamermesh, M., with others, radar reflections, from long conductors, **1687**, from wires, theory, **3035**
Hamilton, G. E., and R. K. Olsen, transmission line measurements in television aerial design, **2262, 3303**
Hammack, C. M., cathode follower with very low output resistance, **(A) 663**
Hammann, P. L., radar amplifier, **3069**
Hands, P., with S. E. Williams, solar radiation on 75 Mc/s, **(A) 405**
Hanscome, T. D., with D. G. Fink, electronics in atomic bomb tests, **1892**
Hansell, C. W., radio relay systems, **2835**
Hansen, W. W., wow meter, **(A) 2307**
Hanstock, R. F., and E. H. Lloyd, X-ray method of measuring Poisson's ratio, **2204**
Harang, L., auroral luminosity curve, **417**; polar geomagnetic storms, **412**
Harden, L. R., with others, supersonic power output of quartz crystal, **2442**
Harding, G. N., with others, wide-band aerials and transmission lines for 20–85 Mc/s, **1318**
Harding, J. P., radio masts in reinforced concrete, **1203**
Hardy, A. E., television white screen and I.C.I. colour system, **(A) 4051**
—— with R. E. Johnson, testing long-persistence c.r. screens, **(A) 3921**
Hare, M. D., with F. H. Crawford, donutron, tunable squirrel-cage magnetron, **(A) 947, 2987, (A) 3342**
Harms, J. H., single control in band-switching transmitter, **929**
Harries, J. H. Owen, cavity resonators, effects of apertures, **1034**, and electron beams, **2706, (D) 3824**; secondary emission suppression, **3713**
Harris, C. M., with H. Feshbach, non-uniform wall material and room acoustics, **342, (A) 3764**
Harris, D. B., selective demodulation, **3059**
Harris, H., Jr, frequency response of automatic control systems, **(D) 3289**
Harris, W. A., with J. E. Young, 12-channel f.m. converter, **1187**
Harrison, A. E., microwave frequency stability, **(A) 1139, 3321**
Harrison, C. E., reducing amplitude distortion, **(A) 2307**
Harrison, T. R. P., impulse testing plant for cables, **2848**
Hart, S. D., with M. F. M. Osborne, elastic wave propagation, **1**
Hartkopf, R. E., valve tester, **816**
Hartman, P. L., with others, magnetron for cm λ generation, **293**
Hartree, D. R., calculating machines, developments, **(AD) 2480, 3952**, Eniac, **462**
Hartshorn, L., with N. R. Campbell, experimental basis of electromagnetism, **3091**
Hartzler, A. J., and others, synchronization of auxiliary apparatus with betatron, **3609**
Harvard University, Computation Laboratory, Manual of Operation for the Automatic Sequence Controlled Calculator, **(B) 468**
Harwood, M. G., P. Popper and D. F. Rushman, Curie point of $BaTiO_3$, [illegible]
Hasted, J. B., with others, dielectric properties of water, **2844**
Hastings, A. E., RC parallel-T network, **(C) 3453**
Hastings, C. E., Raydist navigation and tracking system, **3131**
Hathaway, J. L., and W. Hotine, pocket ear, **3637**
—— and R. Kennedy, radio mike, miniature transmitter, **3693**
Haubert, A., e.m. wave propagation and impedance concept, **218**
U.R.S.I. conference, **596**
Hauss, G., telecontrol for V-2 rockets, **2886**
Havens, R. J., with others, temperature and pressure measurements, to 90 km height, **2116**, to 120 km height, **3522**
Hawkes, H. D., with G. F. Shotter, a.c./d.c. power and voltage comparator, **183, (A) 803**
Haworth, A. M., cylindrical draughting machine, **1296**
Haxby, R. O., and others, Purdue microwave electron accelerator, **(A) 1540**
Hay, G. A., dynatron as negative resistance circuit element, **36**
Hayes, A. E., Jr, r.f. heating of cyclotron filaments, **495**; stabilized modulated oscillator, **1381**
Hayes, K. A., elements of position control in servomechanisms, **(A) 4039**
Haylon, W. D., with others, progress in engineering knowledge in 1946, **2996**
Haynes, J. R., with others, spark gap switches for radar, **899**
Hays, C., bandswitching v.f.o. exciter, **3828**
Hays, C. V., amateur superheterodyne receiver for λ 10–80 m, **2564**; 10-m vertical coaxial aerial, construction, **639**
Haywood, W. J., linear sweep generator, **902**
Hazen, W. E., cosmic rays, airborne cloud chamber for, **(A) 1075**, soft component, **(A) 1425**
Heacock, D. P., power measurement of class-B audio amplifier valves, **3578**
Healy, C. P., radio equipment in tropics, **1826**
Hedke, H. A. W., with others, telecontrol of water pumping station, **840**
Heeren, V. L., and others, telemetering from V-2 rockets, **2536, 3242**
Hees, G., with H. Jacobs, Richardson's equation and oxide cathodes, **(A)** [illegible]
Hegbar, H. R., with others, 1-kW f.m. magnetron for 900 Mc/s, **3731**
Heightman, D. W., whistling meteors, **(D) 3875**
—— and E. J. Williams, propagation of 5-m waves, **1179**
—— with E. J. Williams, skip distance effect on 5 m, **(D) 3631**
Heins, A. E., with J. F. Carlson, reflection of plane wave by infinite set of plates, **2756, 3504**
Heisenberg, W., (Ed.), Kosmische Strahlung, **(B) 83**
Heisler, M. P., induction and constant-temperature heating charts, **3605**
Helber, C. A., stability of u.h.f. oscillators, **2708**
Held, F., with H. Stäger, softening of polyvinyl chloride, **1488**
—— with others, dielectric and mechanical properties of organic layered insulating materials, **1474**
Heidmann, J. D., glass manipulation technique in research, **782**
Helliwell, R. A., with others, meteor detection by radio, **1417**
Hellmann, R. K., with L. Kemath, sweep balance recorders, **(A) 2948**
Helm, M. S., with C. E. Skroder, Circuit Analysis by Laboratory Methods, **(B) 1084**
Helm, R., K. Spangenberg and L. M. Field, cathode design for electron-beam tubes, **4071**
—— with others, electron beam dispersion at high vacuum, **3849**
Helmholz, A. C., J. V. Franck and J. M. Peterson, synchrotron r.f. system, **(A) 1165**
Helterline, L., voltage regulator, **3440**
Hémardinquer, P., teleran, **2433**; television; image quality and definition, **1954**, screens, **1608**
Hemmendinger, H., with others, infra-red sensitive phosphors, **121**
Henisch, H. K., TiO_2 rectifiers, **248**
Henney, K., nucleonics and electronics, **3745**
Henvis, B. W., wavelengths of sound, **2309**
Hereford, F. L., Jr, electron acceleration, **(A) 3998**
Herman, R. C., and C. F. Meyer, thermoluminescence and conductivity of phosphors, **743, (C) 2797**
Herne, H., vacuum lead-in, **118**
Herold, E. W., valve amplification factor, **3356**
Hérou, R., and M. Romanowski, Maxwell-Wien bridge for comparing inductance standards, **798**
—— with M. Romanowski, inductance standards, **1129**
Herpin, A., reflection by stratified system, **3865**
Herr, R., acoustic lens for underwater sound, **(A) 2307**
Herreng, P., with G. Couanault, standard generator, **3970**
—— with others, impedance deviations in cable sections, **3779**
Herrick, J. F., with H. M. Wagner, self-switching r.f. amplifier, **3443**
Herrmann, D. B., with others, hard rubbers, **(A) 780**
Hershberger, W. D., E. T. Bush and G. W. Leck, absorption of microwaves by gases, thermal and acoustic effects, **2757**
Hershfield, S., cylindrical aerials, **(D) 2353**
Herskind, C. C., and E. J. Remscheid, operation of ignitrons, **574**;
—— and H. C. Steiner, working characteristics of ignitrons, **574**
Herwald, S. W., and G. D. McCann, analysis of servomechanisms by electrical analogy, **543, (D) 3287**
—— with others, electrical analogies for servomechanisms, **(D) 891**
Herzfeld, K. F., crystal rectification and diode theory, **(A) 285**
—— with others, supersonic waves and conductivity of salt solutions, **1397**
Hessler, V. P., teaching electricity and magnetism, **1285**
Heumann, G. W., motor control systems, basic principles, **3212, 3985**, for induction motors, **3986**
Hewlett, C. W., Tl_2S photocell, **2972**
Hey, J. S., discussion on the ionosphere, **(D) 3120**; 1946 Giacobinid meteor shower, **2085**
—— and G. S. Stewart, determination of meteor stream radiant by radio observation, **2086**
—— with E. V. Appleton, solar radio noise, **3508**, circular polarization of, **86**
Hey, V., and S. Zayentz, pulse corona, **2399**, discharge paths of, **2398**
Hibbard, L. U., measurement of small time intervals, **(A) 1852**; pulse peak kilovoltmeter, **3965**
Hickernell, L. F., and C. J. Snyder, lead alloy for cable sheathing, **(D)** [illegible]
Hickin, E. M., bolometers for v.h.f. power measurement, **189**
Higgins, T. J., with H. P. Messinger, inductance of coaxial busbars, **(D) 631**
Hilger, Adam, Ltd, Schwarz thermopiles, **190**
Hill, C. G. A., fluorescence of $MgWO_4$, **1105**
Hill, D. M., f.m. signal generator, **(A) 3200**
—— and M. G. Crosby, design of f.m. signal generator, **818**
Hill, E. L., uniformly accelerated motions and classical e.m. theory, **3843**
Hill, J. M., tone control at low volume levels, **621**
Hillan, A. B., parallel-T bridge amplifier, **2051, (A) 3071**
Hillger, R. E., and others, microwave absorption of carbonyl sulphide, **(A) 3872**
—— with others, inversion spectrum of NH_3, **3096**
Hilliard, J. K., amplifier for disk recording, **618**
Hillier, J., electron microscope, **3610**
—— and E. G. Ramberg, magnetic electron microscope objective, **2530**
—— with others, Electron Optics and the Electron Microscope, **(B) 1174**; resolution in electron microscopes, committee report, **1889**
Hills, E. G., u.h.f. aerial for trains, **641**; v.h.f. impedance measurement, **3961**
Hilton, F., with L. C. Killian, 250-W f.m. transmitter, using cascade phase-shift system, **1617**
Himpan, J., with J. Picht, electric deflection of electron beams, **(A) 1603**
Hings, D. L., noise reduction in c.w. reception, **3647, 3649**
Hinman, D. D., with others, current transients measurement in l.v. circuit, **1845**
Hinman, W. S., Jr, and C. Brunetti, radio proximity fuse, **1555**
von Hippel, A., electric breakdown of solid dielectrics, **2809**
—— and L. G. Wesson, polystyrene plastics as h.f. dielectrics, **763**
—— and others, ceramics with high dielectric constant, **759**
—— with S. Roberts, dielectric constant and loss measurement at u.h.f., **178**
His Majesty's Stationery Office, B.B.C., draft of charter, **2305**, licence and agreement, **2304**; British Commonwealth scientific conference, **2295**
Hoadley, J. C., receiver, high-fidelity, **855**, miniature-valve, **3260**
Hoag, O., power supply for microwave equipment, **1951**
Hobson, P. T., magnetic recording, **(A) 2319**
Hodge, E. S., with others, plastic optical and infra-red filters, **3541**
Hodgins, J. W., persistent currents in frozen metal-ammonia solutions, **714**
Hoeppner, C. H., with others, telemetering from V-2 rockets, **2536, 3242**
Hoffman, R. B., and E. W. Markow, mobile f.m. communication equipment, **3665**
Hoffman, W. B., with J. Creamer, Radio Sound Effects, **(B) 1000**
Hofstadter, R., potentiometer circuit to produce tangent function, **161**
—— with others, rate-of-change meter, **2870**
van Hofweegen, J. M., impedance measurement with non-tuned Lecher system, **2171**
Hok, G., response of linear system, **(A) 3813**
Holden, A. N., with others, rotational spectra of linear molecules at λ 1 cm, **1732**
Hole, N., statistics in counter technique, **1877**
Hollabaugh, M. G., with A. M. Levine, broad band amplifiers, **(A) 3479**
—— with others, feedback amplifiers, **(A) 3483**
Hollenberg, A. V., S. Millman and N. Kroll, multi-cavity rising-sun magnetron, **(A) 292**
Hollis, W. C., transmission-line tank circuits, **2716**
Hollway, D. L., ionization manometer, **3916**
Holm, R., initial current density in arcs, **2395**
Holmes, A. C., h.f. cables *vs* waveguides for telephony, **(A) 1003**
Holmes, L. C., magnetic recording, **(A) 2307, 3415**
Holmes, P. J., vibration exciter for structural tests, **1147**
Holmqvist, S., a.c. potentiometer, **1515**
Holroyd, L. V., B. A. Mrowca and E. Guth, dielectric properties of rubber, **(A) 3167**
Holstein, T., energy distribution of electrons in h.f. gas discharge, **1407**
Holt, L. E., German sonic listening systems, **3758**
Hölzer, E., F. H. Gecks and G. Kamphausen, propagation of short a.m. and f.m. waves, **2236**
Hooke, A. H., valve grid emission measurement, **2505**
Hooper, J. W., with others, studio and speech input equipment, **350**
Hooton, H. D., amateur band transmitter, **928**
Hopf, P. P., silver coatings, **3166**
Hopkins, A. F., Jr, and F. A. B. Smith, radio-controlled buoys, **1454**
Hopkins, R. J., over-voltage testing of capacitors, **3575**
Hopper, F. L., and R. C. Moody, sound recording transmission system, **344**
Hopper, G. M., with H. H. Aiken, automatic sequence controlled calculator, **461, 787**
Hopper, V. D., determination of *e* by oil-drop method, **1402**
Hopwood, W., with J. D. Craggs, spectroscopic analysis using electron multiplier, **831**
Hornbostel, J., light pattern method for groove recording, **1985**
Horner, F., spaced-loop direction-finder for v.h.f., **2783, (A) 3529**; summation of simple harmonic functions of random phase, **3566**
Hornfeck, A. J., industrial electronic measuring instruments, **(A) 2248**
Horsting, C. W., carbide structures in carburized thoriated-tungsten filaments, **2614**
Horton, C. W., use of e.m. waves for geophysical prospecting, **3600**
—— with R. B. Watson, radiation patterns of dielectric rods, **(A) 3794**
Hoselitz, K., hard magnetic materials, **445**
Hotine, W., with J. L. Hathaway, pocket ear, **3637**
Houghton, W. D., with others, pulse time division radio relay, **3281**
Houldin, J. E., with others, u.h.f. radio measurements, **(D) 1130**
Houstoun, R. A., Se photocells, **3710**
Houts, C. C., with others, paper capacitors containing chlorinated impregnants, **655, (A) 3811**
Hovde, F. L., science, politics and national welfare, **3362**
Howard, P. L., with J. B. Mullen, AgCl-Mg water-activated battery, **3295**
Howe, G. W. O. (See also G.W.O.H. under Anon) ionosphere, history and mechanism, **1779**
Howell, H. A., sound recording on coated paper tape, **1996**
Howell, P. A. de G., effect of moon on radio wave propagation, **2963**
Howells, P. W., stabilized 160–1500-V power supply, **3675**
Howland, B., scale-of-N counting circuits, **3804**
—— with others, diode coincidence circuit, **(A) 3869**
Hsu, Chang-Fen, absolute rotation and rotating magnet, **3084**
Huber, E., multichannel directional carrier-current systems, **1930**
Huber, P., F. Alder and E. Baldinger, rapid counter tubes, ion velocity, **2367**, pulse shape, **2368**
—— with others, counter tubes with alcohol vapour, **2748**
Huber, W. A., graphical analysis of cathode-biased degenerative amplifiers, [illegible]
Hudson, R. G., Introduction to Electronics, **(B) 605**
Huggins, W. H., node-pair method of circuit analysis, **39**
Hughes, D. H., band-spread tuners, for broadcast receivers, **(D) 1195**, design, **(D) 3072**; v.h.f. a.m. mobile telephone equipment, **3276**
Hughes, D. J., mass of meson, **(A) 1428, 3111**
Hughes, H. K., molecular dipole moment and moment of inertia, **707**
Hughes, J. W., stabilization of d.c. supplies, **4045**; threshold of hearing, **614**
Hughes, R. H., and E. B. Wilson, Jr, microwave spectrograph, **3205**; network for solution of secular equations, **3562**
Hull, A. W., stresses in cylindrical glass-to-metal seals, **430**
Hull, G. F., Jr, resonant circuit modulator for broadband acoustic measurements, **1702**
Hultgren, R. D., and L. B. Hallman, Jr, theory and application of radar beacons, **3533**
Hum, J., 5-m equipment from existing equipment, **1935**
Humbert, R., operational calculus, classes of formula, **783**
Hume-Rothery, W., nature of metals, **145**
Humphrey, R. H., Experimental Course in the Fundamental Principles of Radio, **(B) 324**
Hunn, B. A., nature of rotation, **390**
Hunt, L. B., Electrical Contacts, **(B) 781**
Hunter, L. P., energy build-up in magnetrons, **(A) 291, 1641**
Hunter, M. J., with others, dielectric constant of silicones, **761**
Hunter, P. H., television receiver test equipment, **268**
Hunter, T. A., precision master oscillators, **2363**
Huntoon, R. D., and A. Weiss, synchronization of oscillators, **3467**
Hurdle, B. G., with others, acoustic effects of marine fouling, **3399**; propagation of pressure waves in Hg at 100 to 1000 Mc/s, **2755**
Hushley, W., and K. Feldman, portable G-M counters, **3977**
Hustrulid, A., with others, mass spectrometer for leak detection, **2441**
Hutchinson, W. G., deterioration of matériel in tropics, **438**
Huth, A., broadcasting, post-war situation outside U.S.A., **1588**
Hutter, M. E., supersonic depth sounding and flaw detection, **2184**
Hutter, R. G. E., electron optics of deflection fields, **(A) 1154, 3346**
Huxford, W. S., modulation in infra-red signalling, **(A) 1154, 3241**
—— with others, modulation of Cs arc, **(A) 4023**
Huxley, H., illumination of instrument dials, **151**
Huxley, L. G. H., H. G. Foster and C. C. Newton, gyro interaction of radio waves, **2897**
Huynen, A., wartime telecommunication in Belgian Congo, **870**

I

Iams, H., phase-front plotter for cm λ, **3590**
Iannone, F., and H. Baller, gas-tube coupling for d.c. amplifiers, **60**
Ide, J. M., R. F. Post and W. J. Fry, underwater sound propagation at l.f., **(A) 2307**
Iliovici, A., measurement of apparent power and energy, **1507**
Inskip, F. A., television test-pattern generator, **267**
Institution of Electrical Engineers, naval gunnery radar, **(D) 1802**
Ioffe, A. F., semiconductors, **3546**
—— with A. V. Ioffe, contact between semiconductor and metal, **(A) 1828**
Ioffe, A. V., and A. F. Ioffe, contact between semiconductor and metal, **(A) 1828**
Ionescu, T. V., and V. P. Mihu (Mihul), induction effect due to negative ions, **3093**
Irland, G. A., sign of reactive power, **(D) 1972**
Irving, D. B., cable terminations, **(D) 2324, (D) 3420**
Isaac, L. B., television in cinemas, **2264**
Isaacs, J., punch press protector, **1159**
Ives, R. L., interference from meteorological installations, **1925**
relay oscillator, 100 c/s to 10 c/hr, **1030**

J

Jackson, J. F., with others, diffusion from plane surface, **3494**
Jackson, W., dielectrics for telecommunication purposes, **(A) 314, 440, 1973**; post-graduate electrical engineering courses, **(A) 314, (D) 600, 1973**; representation of dielectric properties and measurement at cm λ, **2843**
—— and J. S. A. Forsyth, power factor of polythene, **2145, (A) 3161**
—— and J. G. Powles, dielectric absorption in benzene and liquid paraffin at u.h.f., **2841**
—— with others, voltage characteristics of polythene cables, **3179, (A) 3959**
Jacob, L., electron trajectories, **3085**
Jacobs, C. R., acoustical design of studios, **3008**
Jacobs, H., oxide cathodes and dissociation energy, **(A) 280, 284**
—— and G. Hees, Richardson's equation and oxide cathodes, **(A) 3858**
Jacobs, R. B., and H. F. Zuhr, developments in vacuum engineering, **2440**
Jacot, H., carrier-current telephony, **4025**
Jacques, R. B., aerial radiation patterns, **2016**
Jacquet, P. A., surface finish of copper, **(A) 2155**
Jacquinot, —, — Dumesnil and — Boughon, quartz crystal equivalent circuit, **482**
Jacquinot, P., with P. Boughon, signals with rectangular frequency spectrum, **926**
Jaeger, J. C., equivalent path and absorption in ionosphere region, **3252**
Jaffe, A. A., with J. D. Craggs, spread of discharge in Geiger counters, [illegible]
James, H. M., phosphorescence decay in Cu activated ZnS, **(A) 2443**
Japolsky, N. S., electric and magnetic vectors in e.m. waves, **3503**
Jarvis, K. W., railway safety signal systems, **(A) 1217**
Jefferies, D. W., broadcast aerial installation, **637**
Jefferson, H., filter design tables, **3819**
Jeffery, E., push-pull phase splitter, **3837**
Jeffries, C. D., u.h.f. heterodyne frequency meter, **3194**
Jelonek, Z., locking phenomena in oscillators, **1037**
—— E. Fitch and J. H. H. Chalk, diversity reception, **1920**
Jenny, F., 50-kW water-cooled transmitting triode, **1634**
Jensen, F. W., and A. L. Parrack, chemical applications of h.f. oscillators, **1893**
Jenvey, W. W., with others, r.f. measurements on rhombic aerials, **1857**
Jepsen, R. L., Ta cylinder cathode for c.w. magnetrons, **3728**
—— with others, mica windows as elements in microwave systems, **3921**
Jervis, A. E. L., silicones, survey and uses, **756**
Jesatko, J. M., with H. A. Frey, breakdown of ceramic dielectrics at high temperatures, **2810**
Jesty, L. C., H. Moss and R. Puleston, war time developments in c.r. tubes for radar, **2983**
John, R. S., and K. J. Germeshausen, gramophone pickup using strain gauge, **618**
Johnson, E. O., ultra low loss transmission line for television, **2667**
Johnson, F. S., with others, ultraviolet solar spectrum up to 88 km height, **1421**
Johnson, H., coaxial-line diode noise source for u.h.f., **3722**
Johnson, H. C. E., fluorine and compounds, teflon, **3169**; silicones, survey and uses, **129**
Johnson, H. W., BC 221 frequency meter as v.f.o., **2270**
Johnson, J. B., c.r. tube with cylindrical screen, **1640, (A) 4077**; enhanced oxide-cathode emission, **(A) 281**; secondary emission of thermionic oxide cathodes, **(A) 282**
Johnson, M. H., G. T. Rado and M. Maloof, complex permeability of iron at v.h.f., **3182**, of metals at u.h.f., **(A)** [illegible], of permalloy, **(A) 3923**
—— with others, complex permeability of magnetic iron at 200 Mc/s, **(A) 3183**
Johnson, R. C., R. C. Weidler and D. Williams, infra-red spectrum of H_2O and D_2O, **(A)** [illegible]

Johnson, R. E., and A. E. Hardy, testing long-persistence c.r. screens, (A) **3921**
Johnson, W. A., with others, dielectric absorption of solutions, **2839**
Jolivet, P., e.s. h.v. generator, **4042, 4043**
Jolly, F. J., theory and practical limitations of dielectric heating, **2194**
Jones, A. Taber, references to contemporary papers on acoustics, **2306, 3386, 3747**
Jones, E. A., models for radiation pattern measurement on vehicles, (A) **2011**
Jones, F., and R. Sear, cable impedance measurement at u.h.f., **175**
Jones, F. E., Oboe blind-bombing aid, **1790**
Jones, H. Spencer, sunspots and radio, **91** ; time measurement, **194**
Jones, M. C., and C. Sontheimer, Micromatch for measurement of s.w.r.and r.f. power, **2853, 3188**
Jones, M. W., with others, ionosphere and solar eclipse of Jan. 1944 at Huancayo, **503**
Jones, P. L. F., c.r. tube quality test, **908**
Jones, S. B., magnet design for cosmic-ray cloud chambers, (A) **1118**
Jones, T. A., and K. W. Pfleger, relative merits of carrier telegraphy methods, **528**
Jones, W. M., with A. F. Brown, electron microscopy replica technique, **3239**
Jones, W. T., microwave test and measuring equipment, **799**
Jonker, G. H., with J. H. van Santen, permittivity of $BaTiO_3$, **2459**
Jonker, J. L. H., control of current distribution in valves, **3719**
Jonlet, J. G., telecommunications in Belgian Congo during the war, **2925**
Jordan, E. C., and W. E. Miller, slot aerials, **1677**
Jorysz, A., bibliography of disk recording, **3013**
Josephs, H. J., Heaviside's Electric Circuit Theory, (B) **63**
Jouaust, R., ionosphere and wave propagation, **1447**, (D) **3520** ; low altitude ionosphere echoes, **1774** ; origin of E layer, **1776**
Jouguet, M., heat treatment by h.f. eddy currents, **2515** ; heating of ferromagnetic materials by eddy currents and hysteresis, **2752** ; propagation, in circular waveguides, **1320, 2000, 2669, 3786**, in curved waveguides, **16, 1005**, in rectangular waveguides, **1667, 1668, 3785**
Jounin, H., natural frequencies of nonlinear systems, **669**
Jouty, R., and Y. Rocard, multiple self-oscillations on wire, **1728**
Juley, J., A.A. fire control computer, **1494**
Jurriaanse, T., voltage stabilizing valves, **2277**
—— F.M. Penning and J. H. A. Moubis, cathode sputtering in gas discharge tubes, **592**
Juster, F., automatic controls in modern receivers, **2914**

K

Kabanov, N. I., u.s.w. radio observations during solar eclipse of 9th July 1945, **2095**
Kac, M., and A. F. J. Siegert, receiver noise theory, (A) **1199**
—— and A. J. F. Siegert, noise in receivers with square-law detectors, **3645**
Kadyshevich, A., secondary electrons, velocity distribution, **2403**, depth of generation, **2404**
Kahan, T., cavities and waveguides for particle accelerators, **2200** ; perturbations and radiation pressure in e.m. cavities, **1707** ; waveguide, rectangular cross-section, modes, **15**, reflection by disk in, **1006**, termination effects, **17**
—— and A. Kwartiroff, pulse counter, registering to arbitrary scale, **1878**
Kaiser, H. F., European electron induction accelerators, **2527**
Kalinin, V. I., general theory of electron oscillations at u.h.f., **3470**
—— and I. I. Wassermann, electron oscillations in magnetron, **3729**
Kallmann, H. E., equalized delay lines, **41** ; standing wave meter, **1503**
Kammerer, J. A., with others, rate-of-change meter, **2870**
Kamphausen, G., with others, propagation of short a.m. and f.m. waves, **2236**
Kandoian, A. G., wide-band aerials, (A) **1004**, (A) **3026**
—— with D. D. Grieg, u.h.f. pulse time multiplex broadcasting, (A) **1217**
—— with others, aircraft u.h.f. course indicator, **1094**
Kang, Bun Po, dielectric loss of insulating oils, **443**, (D) **3160**
Kapustin, A. P., dielectric permeabilities and dipole moments, **3957**
Karmasn, J., with G. Spiwak, imprinting of images by lightning, **1456**
Karpius, E., u.h.f. field-strength measuring equipment, **819**
Kasner, E., a.f. tachometer, **2174**
Katchatouroff, L., and R. Delavenne, h.f. impedance bridge **3960**
Kater, J. A., with A. J. Christopher, mica capacitors for carrier telephone systems, **374**, (D) **3050**, (A) **3458**
Katsman, Yu. A., high power klystron using Hartley circuit, **4083** ; noise suppression in klystron used as u.h.f. amplifier, **3481**
Katz, L., with C. J. Marshall, television equipment for guided missiles, (A) **1239, 3243**
Kauke, J. R., with others, telemetering from V-2 rockets, **2536, 3242**
Kanzmann, A. P., rectifiers, high-vacuum, **3707**
Kazantsev, A. N., radio observations during solar eclipse of 9th July 1945, **2094**
Kearney, J. W., coaxial cavity oscillator design, (A) **1026, 3058**
Keen, A. W., shorthand circuit symbols, **2030** ; television synchronization, (D) **4048** ; valve equivalent circuit, (D) **3721**
Kees, H., 250-W a.m. broadcast transmitter, **3323**
—— and F. Gehres, cavity aircraft aerial, **1346**
Keinath, G., test equipment for repair workshops, **169**
—— and R. K. Hellmann, sweep-balance recorders, (A) **2248**
Kell, R. F., and G. C. Sziklai, miniature airborne television equipment, **2961**
—— and others, colour television system, **2958**
Keller, A. C., sonar for submarine detection, **2427**
Keller, H., with others, properties and construction of crystal filters, [illegible]
Keller, J. B., with others, sound diffraction round circular disk, **1978**
Keller, W. A., with others, telecontrol of water pumping station, **840**
Kellogg, J. B. M., and S. Millman, magnetic resonance method for r.f. spectroscopy, **1731**, (A) **3845**
Kellogg, W. M., navy fire-control radar, **2437**
Kemp, A. R., with others, hard rubbers, (A) **780**
Kennedy, R., with J. L. Hathaway, radio mike, miniature transmitter, [illegible]
Kent, E. L., changing frequency of complex wave, (A) **965, 3048**
Kerkhof, F., thermoelements for radiation measurement, **1155**
Kermack, W. O., reality index for cyclic variations, (D) **2829**
Kerrich, J. E., An Experimental Introduction to the Theory of Probability, (B) **164**
Kersten, P. M., modifications to BC-348-Q receiver, **1568**
Kerwin, L., geologic mapping equipment, **3601**
Kharbanda, S. R., with others, television sound on vision carrier, **263**, (A) **264**
Khastgir, S. R., M. K. Das Gupta and D. K. Ganguli, location of thunderstorm centres, **3132**
—— J. N. Ray and A. Banerjee, h.f. and m.f. properties of Indian soils, [illegible]
—— with S. C. Mitra, interelectrode capacitances of triodes, **1501**
Khokhlov, A. S., with Ya. S. Shur, magnetostriction of transformer steel, **3945**
Khvoles, V., with others, highly ionizing particles in cosmic radiation, **1785**, [illegible]
Kiepenheuer, K. O., ionosphere, sunspots and solar corona, (A) **3127** ; origin of metre-wave solar radiation, **87** ; slow corpuscular radiation from sun, **3877**
Kilgore, G. B., C. I. Shulman and J. Kurshan, 25-W f.m. magnetron for 4000 Mc/s, **3730**
Killian, L. C., and F. Hilton, 250-W f.m. transmitter, using cascade phase-shift system, **1617**
Killian, L. G., P. L. Tourney and J. W. Hooper, studio and speech input equipment, **356**
Kimbark, E. W., sign of reactive power, (D) **1972**
King, D. D., impedance measurement, of cylindrical dipoles, **1338**, on transmission lines, **2673**
King, G. W., and R. M. Hainer, microwave absorption of HDO, (A) **2390**
—— R. M. Hainer and P. C. Cross, microwave absorption of water and related molecules, **3099**
King, J., with L. G. Groves, moisture content of cereals by permittivity measurement, **825**
King, R., cylindrical aerials, (D) **2333**
King, R. B., with P. C. Thonemann, h.f. energy from ionized gas, **715**
King, R. W. P., aerial radiation, (A) **2335**
King, W. J., detecting corona in cables, **627**
Kingdon, K. H., with J. M. Lafferty, electrometer valve stability, (A) **583, 1964**
Kinn, T. P., and J. Marcum, microwaves for h.f. heating, (A) **1154, 3226**
—— with J. Marcum, dielectric heating with microwaves, **2518**
Kinsinger, W. G., and others, resolution in electron microscopes, committee report, **1889**
Kinzer, J. P., and I. G. Wilson, currents in walls of cylindrical cavity resonators, **3464**
—— with others, high-Q resonant cavities for microwave testing, **378**
Kip, A., and others, counting rate meter, **1150**
—— with others, design of β- and γ-ray G-M counters, **484**
Kircher, R. J., with R. C. Shaw, water load for power measurement, **2172**
Kirchner, F., effect of d.c. potential on r.f. discharge, **3856**
Kirk, J. A., superregenerative 2-m receiver, **523**
Kirke, H. L., discussion on the ionosphere, (D) **3120** ; f.m., B.B.C. field trials, (A) **2238** ; omnidirectional aerial with concentric feeder, **3434** ; pulse technique in broadcasting, **1932**
Kirkpatrick, G. M., voltage-regulator valves, **2980**
Kirkwood, J. G., dielectric polarization of polar liquids, **2735**
Kirschbaum, H. S., with others, electrical analogies for servomechanisms, (D) **891**
Kisun'ko, G. V., theory of excitation of waveguides, **2326**
Kittel, C., dispersion of magnetic permeability at u.h.f., **1460** ; theory of structure of ferromagnetic domains in films and small particles, **2072**
Kiver, M. S., Television Simplified, (B) **924** ; video detector circuits, **1610**
Klaiber, G. S., and others, synchronization of auxiliary apparatus with betatron, **3609**
Klasens, H. A., light output of ZnS irradiated by α rays, **1106**
—— and M. E. Wise, luminescence decay in ZnS phosphors, **2135**
Klauser, H., dm wave impedance measurement, **1862**
Klein, M. J., with others, sound diffraction round circular disk, **1978**
Klein, M. S., high-power thermionic cell with positive ion emission, **593, 954**

Klemperer, H., with R. Briggs, spot welder, **3618**
Klemperer, O., strip-cathode emission systems, **3328**
Klemt, A., h.f. non-metallic resistors, **1019**
Kline, M. B., cathode-follower abac, **2717**, for pentodes, **3455, 3832**
Kmosko, J. A., 2-m rotary beam aerial, **643**
Knauert, W. F., with others, midget earphones for military use, **347**
Knight, C. R., magnetic control of anode current, **1257**
Knoop, W., design of c.r. tube circuits, **658**
Knorre, K. G., measurement of dielectric constant at cm λ, **3573**
Knowles, R., grounded-grid valves, **1965**
Knox, J. B., and C. H. Brereton, multichannel v.h.f. radio communication system, **2927**

Koch, K. M., superconductivity, **3851**
Kock, W. E., metal-lens aerials, **1013**, (A) **3802**
Koenig, W., H. K. Dunn and L. Y. Lacy, sound spectrograph, (A) **3396**

Kohl, W. H., with E. F. Burton, Electron Microscope, (B) **1897**
Köhler, H., directional communication system, **1938**
Köhler, J. W. L., and C. G. Koops, a.c. bridge, **3963**
Kohman, T. P., coincidence corrections of counters, (A) **3978**
Koller, L. R., and J. S. Burgess, secondary emission from Ge, B and Si, **746**
Koller, R., vacuum switch, **2946**
Kolomiec, B. T., S–Tl photocells for sound reproduction, **2199**
Kompfner, R., klystron as amplifier at cm λ, **3355** ; travelling-wave valve, **585, 4065**, as microwave amplifier, **2286**
Koontz, P., and E. Dilatush, voltage-regulated power supplies, **4046**
Koops, C. G., with J. W. L. Köhler, a.c. bridge, **3963**
Korff, S. A., and B. Hamermesh, cosmic radiation, and nucleons, **3515**, production of neutrons by, **1427**
Kormakova, E. G., electron multipliers, **578**
Korman, N. I., cathode-coupled triode amplifiers, **2046** ; network reflection-coefficient meter, **18** ; wave selectors, (A) **1004, 3019**

—— with J. R. Ford, stability and frequency pulling of unstabilized oscillators, **667**
Kornei, O., magnetic recording, (A) **2307**
Kosonogova, K. M., with V. E. Laškarev, effect of impurities on rectifier photo-effect of Cu_2O, **2283**
Kosten, C. W., sound absorption by porous rubber, **341**
Kothari, D. S., and L. S. Lothari, theory of atmospheric electricity, [illegible]
Krasnooshkin, P., acoustic and e.m. waveguides of various shapes, **1686** ; interaction of oscillatory systems, **2386**
Kraus, J. D., helical beam aerial, **3033**
Krause, E. H., and S. E. Golian, cosmic rays, V-2 rocket tests, (A) **3882**
—— with S. E. Golian, cosmic-ray experiments with V-2 rocket, **3511**
—— with others, cosmic radiation at great heights, **94**
Krauss, H. L., cathode-follower circuit, (D) **3454** ; graphical solutions for cathode followers, **1373**

Kraybill, H. L., with P. J. Ovrebo, cosmic ray showers, (A) **3882**
Krebs, R. P., and T. Dallas, i.c.e. knock pickup amplifier, **1551**
Kretzmer, E. R., single-carrier television, (D) **2263**

Křížek, V., and V. Vand, German infra-red technique, **210**
Kroll, N., and W. E. Lamb, Jr, theory of rising-sun magnetron anode, (A) **297**
—— with others, multi-cavity rising-sun magnetron, (A) **292**
Kroll, W. J., and A. W. Schlechten, Ti and Zr, **147**
Kron, G. E., multiplier photocell, **3331**
Kryter, K. D., J. C. R. Licklider and S. S. Stevens, premodulation clipping for speech intelligibility, **1980**
Kryter, R. J., electronics in measurements, **1882**
Kubetski, L. A., requirements for electron multiplier, **577**
Kuhn, S., calculation of attenuation in waveguides, **1328**, (A) **1674**
—— with H. Bondi, concentric line, critical wavelengths, **3790**
Kunz, C. J., with others, rapid production of photographic records, **459**

Kurčatov, B. V., with J. A. Dunajev, sulphide rectifiers (A) **1828**
Kurshan, J., with others, magnetron modulation, (A) **3698** ; 25-W f.m. magnetron for 4000 Mc/s, **3730**
Kurtener (Courtener), A. V., and E. K. Malyšev, infra-red spectral characteristics of Se filters, **2840**
Kayser, W. W., with others, progress in engineering knowledge in [illegible], **2996**
Kwartskhava, I. F., electron emission from Al_2O_3, (A) [illegible]
Kwai Lui Chung. See Chung, Kwai Lui
Kwal, B., nonlinear wave equations of quantum theory of electron, **2726**
Kwartiroff, A., with T. Kahan, pulse counter, registering to arbitrary scale, **1878**
Kyhl, R. L., R. H. Dicke and R. Beringer, 1-cm absorption in water vapour, (A) **219**
—— with others, microwave absorption, atmospheric, **1843**, of carbonyl sulphide, (A) **3872**, of NH_3, **3096**
Kyser, R. H., with Z. W. Wilchinsky, air-flow u.h.f. wattmeter, **187**

L

Labaw, L. W., and A. O. Williams, Jr, supersonic absorption in water near 1 Mc/s, **1984**
Labhart, H., with G. Busch, mechanism of conductivity of SiC, **1820**
Lacaze, J., atmospheric potential gradient at Tamanrasset, **1781** ; measurement of conductivity of air, **1140**
Lacey, P. M. C., nature of rotation, **1727**
Lacombe, P., and L. Beaujard, X-ray crystallography, **753**
—— with J. Bénard, surface hardening of crystals by polishing, [illegible]
—— with P. Morize, oxidation of Al by air, **130**
Lacy, L. Y., with others, sound spectograph, (A) **3396**
Lacy, R. E., multichannel microwave relay equipment, **2242**
Lader, L., with H. Davis, trends in air navigation, (A) **3137**
Lafargue, M., with R. Aschen, h.f. beat-frequency oscillator, **2358, 3827**
Lafferty, J. M., and K. H. Kingdon, stability of electrometer valves, (A) **583, 1964**
LaGow, H., with others, atmospheric pressure and temperature to 120 km height, **3522**
Lallemand, A., elimination of residual current in photocells, **2278** ; secondary emission and multiplier tubes, **2279**
Lamar, E. S., and W. W. Buechner, ion beams in h.v. tubes, **2627**
Lamb, J., dielectric properties of ice, **2845**
Lamb, W. E., Jr, microwave spectroscope, **1519**
—— and M. Phillips, space-charge/frequency dependence of magnetron cavity, **2989**
—— with N. Kroll, theory of rising-sun magnetron anode, (A) **297**
—— with M. Phillips, space-charge/frequency dependence of magnetron cavity, (A) **290**
Lambert, W. E. C., naval use of servomechanisms, (A) **4039**
Lamont, H. R. L., Waveguides, (B) **359**
—— and A. G. D. Watson, mm λ propagation, **1903**
—— with others, u.h.f. radio measurements, (D) **1130**
Lampitt, R. A., d.c. amplifier with modulated carrier, **679, 1048** ; distortion in diode detectors, **2366**
Lamport, H., and M. G. Schorr, paper screen for ballistics measurement, **489**
Lamson, H. W., a.c. measurements of magnetic properties, (A) **2173** ; permeability of dust cores, (D) **35, 3939**
Landon, L., electron plasma oscillations, **2066**
Lane, C. T., with R. T. Webber, all-metal vacuum gauge, **116**
Langbergh, E. L., linear sweep generator, **656**
Langlois-Berthelot, R., S.F.É. and French electrical industry, **1288**
Langmuir, R. V., and R. B. Nelson, magnetron with water-cooled cathode, (A) **295**
Laplume, J., minimum pass band of pulse transmission system, **665**
Lapostolle, P., intersection of guided wave and electron beam, **1999, 2003, 2325**
—— with A. Blanc-Lapierre, interaction between travelling wave and electron beam in transmission line, **1330** ; propagation in a dispersive medium, **3505**
—— with others, theory of travelling-wave valve, **3421**
Larick, S. H., schematic circuit diagrams, **1369**
Lark-Horovitz, K., with R. Bray, photo- and thermo-effects in *p*-type Ge rectifiers, (A) **2456**
Larsen, M. J., and L. L. Merrill, capacitance-coupled i.f. amplifiers, **2036**
Lasich, W. B., and L. Riddiford, 2.8-MeV betatron, **4000**
Laškarev (Lashkarev), V. E., and K. M. Kosonogova, effect of impurities on rectifier photo-effect of Cu_2O, **2283**
Lasof, S., cathodoluminescence as function of current density, (A) [illegible]
Lassettre, M., and J. O. Everhart, stress-strain relations in ceramic materials, **453**
Latmiral, G., and G. Barzilai, u.s.w. propagation, **4006**
Lattin, W. J., 40-W modulator with cathode-coupled driver, **3703**
Lavagnino, B., and V. Zerbini, electromotive pulse transformer, [illegible]
Laver, F. J. M., with C. F. Booth, frequency standard, (A) **186**, (D) **1143**
Law, H. B., radar navigation, (D) **2128** ; short-period frequency comparison, **2178**
—— with others, mimo, miniature image orthicon, **2959**
Law, R. R., and others, pulse triodes for 1 MW at 600 Mc/s, **2982**
Lawrence, E. O., with others, cyclotron, University of California, **3234**
Lawrence, H. L., 100-kW portable radar transmitter, **566**
Laws, C. A., precision ranging equipment with crystal timing standard, **1894**
Lawson, A. W., and E. A. Long, Brownian motion for low-temperature thermometry, **483**, (D) **2185**
—— P. H. Miller, Jr, and L. I. Schiff, sound field plotter, **3389**
—— with others, thermal ionization of impurity levels in semiconductors, **2453**
Lawson, D. I., A. V. Lord and S. R. Kharbanda, television sound on vision carrier, **263**, (A) **264**
Lawton, C., colonial telecommunication, (AD) **1209**
Lax, L., and H. Feshbach, radiation distribution of cylinder vibrating at high frequencies, **3750**
Lazareva, L., with others, penetrating showers in cosmic rays, **1440**
Lebedinsky, A., with L. Gurevich, magnetic field of sunspots, **1761**
Lebenbaum, M. T., wide-band i.f. amplifier above 100 Mc/s, **3068**
Le Blan, L., effective a.c. voltage regulation, **2024**
Leblanc, M., mechanism of barrier-layer rectifiers, **1468**, (D) **3544**
Leck, G. W., with others, absorption of microwaves by gases, thermal and acoustic effects, **2757**
Leclerc, G., with M. Romanowski, a.c. Wheatstone bridge, **2854**
Lecolazet, R., potential of conductor in earth's field, **1081**
Lecomte, J., G. Champetier and P. Clément, infra-red spectroscopy of molecular groups, **2061**
Ledig, P. G., and others, ionosphere and solar eclipse of Jan. 1944 at Huancayo, **503**
Lee, R., 500-kc/s transformer for power line matching, **1370**
Legg, V. E., permeability of dust cores, (D) **3555**
Legrand, C., with J. J. Trillat, radiographic detection of thin organic layers on steel, **2533**
Lehany, F. J., and W. S. McGuire, interelectrode capacitance meter, **3968**
Lehmann, G., thermal equilibrium of aerials, **642** ; u.h.f. valve circuits, **368**
Leidel, W. F., Jr, and N. E. Payne, variable reluctance gramophone pickup, (A) [illegible]
Leigh, S. H., thyratron motor control, **211**
Lejay, P., and R. Chezlemas, ionosphere soundings in France, April–June 1946, **726**
Leland, G. F., D. E. Watts and T. N. Willcox, dielectric preheating for plastics, (A) **1154, 3225**
Lemas, R., h.f. beat-frequency oscillator, **1709** ; pulse counter circuit frequency meter, **2346** ; pulse technique survey, **1585**
Lenander, S., with S. v. Friesen, relative intensities in electron diffraction diagrams, **1867**
Lenehan, B. E., single-sideband carrier system, **4027**
Lenihan, J. M. A., u.h.f. radio, **232**
Lennox, J. W., powder metallurgy, **2464**
Leontis, T. E., and F. N. Rhines, high-temperature oxidation of Mg and Mg alloys, **2156**
Leontovich, M., diffraction by screens with slit apertures, **2080**
—— and V. Fock, e.m. propagation along earth's surface, theory, **1901**
Leprêtre, R., radar for marine navigation, **733**
Leprince-Ringuet, L., Les Rayons Cosmiques : Les Mésotons, (B) **2124** ; mass measurement of mesons, heavy mesons, (A) **1431** ; nuclear physics, **1067**
—— and M. Lhéritier, heavy particles in cosmic radiation at 1000 m height, **2190**
—— M. Lhéritier and R. Richard-Foy, cosmic rays, high-energy protons, **719**, unusual particles in, **722**

Leshchinsky, J. V., and N. V. Pushkov, work of Ionosphere Bureau, 2419
Leslie, E., with H. W. Secor, anti-collision radio, 427
Leslie, F. M., water-dielectric transmission line as r.f. generator load, [illegible]
Leverenz, H. W., luminescence and tenebrescence applied to radar, 2796
Levi, D. L., diffusion and dielectric relaxation processes, 2744
Levi, F., graphical solution of statistical problems, 464
Levin, E., electronic frequency meter and speed regulator, 1148, (D) 3193
Levine, A. M., pulse-time multiplex broadcasting, (A) 3656
—— and M. G. Hollabaugh, broad-band amplifiers, (A) 3479
—— with D. D. Grieg, pulse-modulated multiplex relay system, 1213
—— with others, feedback amplifiers, (A) 3483
Levinson, N., nonlinear systems of differential equations, 3950 ; Wiener r.m.s. error criterion in filter design and prediction, 1372
Levshin, V. L., luminescence, of crystalline substances, 1812, mechanism in semiconductors, 1810
Levšin. See Levshin
Lévy, J., wave propagation in waveguides with uniformly spaced obstacles, 3780
Lévy, M., properties of quadripoles, 3817
Levy, M. M., Fourier transform analysis, 2351 ; pulse modulation and demodulation theory, 2933 ; pulse technique, 3054
Lewer, S. K., revival of radio techniques, 3375
Lewin, L., electrical constants of material loaded with spherical particles, 2139, (A) 3156
Lewis, E. E., with M. M. Renfrew, polytetrafluorethylene, 149
Lewis, R. F., square-loop aerial for f.m. broadcasting, 2334
Lewis, W. B., field of dipole on two-layer earth, (D) 3436
Lewis, W. D., with H. T. Friis, radar aerials, 3796
Lhéritier, M., with L. Leprince-Ringuet, heavy particles in cosmic radiation at 1000 m height, 2100
—— with others, cosmic rays, high-energy protons, 719, unusual particles in, 722
Libby, L. L., impedance of screened loop aerials, 25, 2014
Lichtman, S. W., with others, telemetering from V-2 rockets, 2536, 3242
Licklider, J. C. R., speech intelligibility and amplitude distortion, 338
—— and E. B. Newman, artificial atmospherics for receiver tests, [illegible]
—— with others, premodulation clipping for speech intelligibility, 1980
Liebermann, L. N., reflection of sound from sea surface, (A) 2307
—— with D. A. Wilson, attenuation of sound in water, (A) 2307
Liebscher, A., television receiver construction, 4057
Liebson, S. H., discharge mechanism of G-M counters, (A) 3982 ; l.v. self-quenching counters, (A) 3981
Lignon, J., with G. Goudet, guided waves in coaxial line, 2665
Linder, E. G., and R. L. Sproull, maximum efficiency of reflex klystron oscillators, (A) [illegible]
von Lindern, C. G. A., and G. de Vries, flat cavities as electrical resonators, 3463
Lindsay, R. H., sign of reactive power, (D) 1972
Lion, K. S., measurement of h.f. electric fields, 2487
Liot, L., Q meter, 1851 ; u.h.f. oscillator, 3056 ; 15-W amplifier for v.h.f., 3836
Lister, W. C., history and development of phototelegraphy, 2257
Little, E. W. R., with J. A. Chalmers, currents of atmospheric electricity, [illegible]
Liubimov, A. L., with others, cosmic rays, intensity measurement, 3883, intensity at 3860 m and 5000 m, 3884
Livens, G. H., electric-magnetic analogy, (D) 3364 ; magnetic energy, (D) 1743
Livingston, O. W., electronic constant-current motor control systems, 3210, 3211
Livingstone, D. F., and J. W. Whitehead, choice of materials for tropical radio equipment, 2142
Livingstone, H., with others, weathering tests on Mg, 1464
Ljašenko, V. I., G. A. Fedorus and S. P. Felvašnikova, metal-semiconductor contact potential, 1816
Lloyd, E. H., with R.F. Hanstock, X-ray method of measuring Poisson's ratio, 2204
Locher, F., a.f. and h.f. filters, survey, 1024
Lockwood, C. A., electronics in submarine warfare, 3537
Lockwood, J. A., with others, cavity accelerator for electrons, 3999
Lodge, W. B., u.h.f. colour television field tests, (A) 1239, (A) 3258
Loeb, J., charged particle in magnetic field, hodoscope for, 2082, model for, 78
Loeb, L. B., electrical discharge through gases, 3854 ; negative point corona, 3089
Loebenstein, J., Se rectifiers, 895
Loeser, G., acceleration measurement by radio methods, 1525
Lofgren, E. J., and B. Peters, f.m. cyclotron and deflector problem, (A) 1161
Logachev, A. A., exploration with airborne magnetometers in U.S.S.R., 410
LoGiudice, T. F., supersonic applications, 1305
Lohr, L. A., db gain-loss calculator, 1842
Long, A. G., Z-callipers, 3215
Long, E. A., with A. W. Lawson, Brownian motion for low-temperature thermometry, 483, (D) 2185
Long, F. V., radioteletype systems for commercial aviation, 3655, for weather news transmission, 536
Long, R. J., rotary aerial for 14 and 28 Mc/s, 640
Long, T. H., wire recorder head design, (D) 620
—— and G. D. McMullen, curve tracer for magnetic-recording wire, (D) 796
Longmire, C. L., RC circuit with over-unity gain, 2702
Loonstra, F., nearly-periodic motions, 2483
Looser, R. C., with others, power loss in e.m. screens, 33
Lopukhin, V. M., design of cavity resonators, 3460
—— with S. Gvozdover, self-excitation of cavity resonator, 3461 ; single-circuit klystrons, theory, 1647 ; theory of monotron, [illegible]
Lord, A. V., with others, television sound on vision carrier, 263, (A) 264
Lord, M. P., A. L. G. Rees and M. E. Wise, ZnS phosphor with ultraviolet excitation, 3919
Lorenz, E., J. Weikel and S. G. Norton, counting rate and frequency meter, [illegible]
Lorenz, J., remote indication of measured quantities, 1499
Losev, O. V., photo effect in carborundum crystals, 1807
Loshakov, L. N., and S. D. Gvozdover, theory of single-circuit klystron, 3739
Lothari, L. S., with D. S. Kothari, theory of atmospheric electricity, 1448
Loubser, J. H. N., with others, cavity resonators for measuring cm waves, 3187
Loughlin, B. D., f.m. detector systems, (A) 3060
Lovell, A. C. B., cosmic rays, origin, 93
—— and C. J. Banwell, solar radiation on 72 Mc/s, 406
Loverdo, A., with others, cosmic ray showers, density spectrum, 2108, 2109, [illegible], penetrating particles, 2110
Lowey, G. S., geometrical addition of parallel resistances, 2379
Loyen, —, Moscow telecommunications conference, 1581
Lozier, J. C., spectrum analysis of p.m. waves, 4062
Lucantonio, F., cables for carrier current systems, 352
Ludbrook, L. C., with E. W. Forster, industrial servo and regulator systems, (A) 4039
Ludeke, C. A., forced vibrations with nonlinear restoring force, 53
Lüdi, F., magnetron theory, 2896 ; natural frequencies of cylindrical resonator, 2354 ; parabolic reflectors, theory, 2357 ; shot effect and sensitivity of transit time valves, 1574
Lüdy, W., temperature effect on dynamic-elastic behaviour of Rochelle type substances, 2447
—— with W. Bantle, elastic behaviour of Rochelle-type substances 2446
Lukoshkov, V. S., e.s. properties of grid electrodes, 938
Luk'yanov, S. Y., secondary emission from solid bodies, 570
[illegible], F. J., with others, aircraft u.h.f. course indicator, 1094
Lundstrom, O. C., with T. Moreno, microwave power measurement, 2850
Lutkin, F. E., R. H. J. Cary and G. N. Harding, wide-band aerials and transmission lines for 20–85 Mc/s, 1318
Lyashenko. See Ljašenko
Lynch, L. E. V., and D. S. Robertson, parallel-T networks for RC oscillators, 659
Lyndon, W. L., test equipment for high-power valves, (A) 1258, 3335
Lyon, W. V., sign of reactive power, (D) 1972
Lyons, W., diversity receiver design, 3636

M

McAllister, J. F., V-2 velocity measurement by Doppler effect, 2512
McCann, G. D., mechanical-transients analyser, (A) 1026, 3172
—— S. W. Herwald and H. S. Kirschbaum, electrical analogies for servomechanisms, (D) 891
—— with S. W. Herwald, analysis of servomechanisms by electrical analogy, 543, (D) 3287
McCarthy, R. L., with others, cavity accelerator for electrons, 3999
McClain, E. F., Jr, stylus for disk reproduction, 3408
MacColl, L. A., electron trajectories in magnetic field, (A) 706
McCullough, J. A., 5-band aerial system, 638
MacDonald, D. K. C., shot effect in photocells, 3329 ; spontaneous fluctuations in double-cathode valve, 953
—— and R. Fürth, spontaneous fluctuations in valves, 4088
—— with J. B. Brown, use of Brownian motion for low temperature thermometry, 2185
—— with R. Fürth, spontaneous fluctuations, statistical analysis, 4089
McElgin, J., dielectric core baking, 2517
McElroy, P. K., iron-cored coils, 2372
McEwan, D. H., with others, measurement of out-of-phase magnetic fields in betatrons, 2524
Macfadyen, K. A., high-impedance r.m.s. voltmeter for iron testing, (D) 3583
Macfarlane, G. G., diaphragms and junctions in transmission lines and waveguides, 1323, (A) 1671 ; eigenvalues of wave equation and tropospheric refraction, 2893 ; flicker noise in valves and semiconductors, 4087 ; refractive-index profile of standard atmosphere, 2894
—— with H. Davies, radar echoes from sea surface at cm λ, 3257
McGillivray, J. A., navigation aids, 2434
McGregor, J. A., 10000-Mc/s communication equipment, 1931, (C) 2930
McGregor, R. R., silicones, 436
Macgregor-Morris, J. T., Ambrose Fleming, life and early researches, 1282
McGuire, W. S., f.m./a.m. signal generator, 3969
—— with F. J. Lehany, interelectrode capacitance meter, 3966
Machlett, R. R., accelerator column for 2–6 MV, (A) 1154, 3235
McIlroy, M. S., cathode follower with rectangular voltage drive, 1025
McIntosh, R., R. S. Haines and G. C. Benson, effect of adsorption on activated carbon, 2083
McKee, J. H., with J. B. Nelson, cerium tungstate as semiconductor, 1182
McKenzie, A. A., and F. Rockett, applications of sonic and supersonic vibrations, 3973
MacKenzie, K. R., and F. H. Schmidt, f.m. for cyclotron, (A) 1162
—— with others, cyclotron, University of California, 3234
McLachlan, N. W., heat conduction and inductance in elliptical cylinder, (C) 3493 ; Mathieu functions, 460
McLaren, J., acoustical planning of broadcasting studios, 3766
McLean, D., electrolytic detection of lead in brass or zinc, 142
McLean, D. A., L. Egerton and C. C. Houtz, paper capacitors containing chlorinated impregnants, 655, (A) 3811
—— with L. Egerton, paper capacitors, containing chlorinated impregnants, (A) 654
McLean, F. C., and F. D. Bolt, transmission lines for broadcasting, (D) 3022
MacLean, W. R., dielectric constant and loss measurement at u.h.f., 177
Maclese, A., and J. Ashmead, rhumbatron waveguide switch, 1325, (A) 1672
McManus, L., two-station aerial system, 878
McMillan, E. M., resonance acceleration of charged particles, (A) 1537 ; violation of reciprocity theorem in electromechanical systems, 370
—— with others, cyclotron, University of California, 3234
McMillan, F. L., Jr, with others, de-ionization time of t.r. switches, 1633
McMullen, G. D., with T. H. Long, curve tracer for magnetic-recording wire, (D) 796
McNalley, J. O., and W. G. Shepherd, reflex oscillators for radar systems, (A) 1026, 3057
McNeal, D., Radar's Conquest of Space, (B) [illegible]
McNicol, R. W. E., ionosphere and radio communication, 220
McNish, A. G., with others, radio observations on meteors, 9th Oct. 1946, 854
McPeak, F. C., with N. D. Webster, experiments in listening, 3007
McPetrie, J. S., and L. H. Ford, u.s.w. propagation, over bare ridges, (A) 509, over land, and effect of obstacles, (A) 511
McPherson, W. L., Reference Data for Radio Engineers, (B) 1301, (B) 3383
McProud, C. G., loudspeaker dividing networks, 3816 ; sonar, 2777 ; transition frequency compensation, 3760
McQuay, J., airborne television apparatus, 2587
McSkimin, H. J., with W. P. Mason, supersonic wave propagation in Al and glass rods, 3393
McWatters, J. T., matching for ground-plane aerial, 3224
Maddock, A. J., heavy-current contact for r.f., 2249, (A) 3671 ; h.f. pre-heating of plastic preforms, 2196
Magat, M., with others, dielectric properties of rubbers, 2815
Maggio, J. B., radar for night fighter aircraft, 3147
Magnan, C., with others, first order elements of e.s. lenses, 835
Maillard, J., multiplex radio links, 1586

de Maistre, X., selectivity by counter-retroaction, 1041
Makinson, K. R., with others, magnetically-controlled gas discharge tubes, 591
Makinson, R. E. B., mechanical analogy for T.E. waves, 3844
—— and others, magnetically-controlled gas discharge tubes, 591
Mallinson, W. D., with T. C. Finnimore, naval fire-control radar design, 1801
Mallory, P. R., & Co., miniature dry cell for tropical use, 547
Malm, F. S., with others, hard rubbers, (A) 780
Malmfors, K. G., charged particle motion and aurora theory, 2426
Maloof, M., with others, complex permeability, of iron at v.h.f., 3182, of magnetic iron at 200 Mc/s, (A) 3183, of metals at u.h.f., (A) 2852, of permalloy, (A) 3823
Malov, N., black body effect in waveguide, 2059
Malter, L., and J. L. Moll, waveguide-output magnetrons with quartz transformers, 2712
—— R. L. Jepsen and L. R. Bloom, mica windows as elements in microwave systems, 3021
Malyšev (Malyshev), E. K., with A. V. Kurtener, infra-red spectral characteristics of Se filters, 2640
Mandelstam, L., group velocity in crystal lattice, 397 ; radiation through resonator aperture, 376 ; wave propagation in guides, analysis, 506
Manley, J. M., and E. Peterson, negative resistance effects in saturable reactor circuits, 2692
Mann, F. J., Alexander Graham Bell, 2646
Mann, W. B., (Ed.), Reports on Progress in Physics, Vol. X, (B) 1415
Manning, L. A., and others, meteor detection by radio, 1417
Mano, C., with C. Biguenet, preparation of carbonates for oxide cathodes, [illegible]
Mannele, J., electric gauges in quality control, 3216
Mao-Lin Tcheng. See Tcheng, Mao-Lin
Marchand, N., [illegible], 3030, 3421 ; f.m. transmitters, 560, mobile, 561
Marchbanks, M. J., coreless induction furnaces, (A) 3223
Marcum, J., and T. P. Kinn, dielectric heating with microwaves, 2518
—— with T. P. Kinn, microwaves for h.f. heating, (A) 1154, 3226
Marcy, H. T., parallel circuits in servomechanisms, (D) 3288
Margenau, H., electron conductivity in gases at u.h.f., (A) 76
—— and others, de-ionization time of t.r. switches, 1633
Mariani, J., theory of terrestrial and solar magnetism, 2115
Marié, P., coupled circuits, attenuation, 1476, transient state, 1377 ; filters, attenuation constant, 861 ; reflection of waves, 2705
Mark, H., and G. S. Whitby, (Eds), Advances in Colloid Science, Vol. 2, (B) 1837
Markov, M., reaction of e.m. field on moving electron, 1404
Markow, E. W., with R. B. Hoffman, mobile f.m. communications equipment, 3665
Marks, M., cascade phase-shift modulator, 1253
Markus, J., F.C.C. radar frequency allocations, 2788 ; vibration exciters, 2188
Mars, M., television receiver, 3313
Marshak, I. S., spark discharge, current and voltage curves, 2065
Marshall, C. J., and L. Katz, television equipment for guided missiles, (A) 1239, 3243
Marshall, D. E., and W. W. Rigrod, characteristics of resistance ignitors, 2945
Marshall, J., superheterodyne receiver tracking formulae, 226
Marshall, J. E., with others, automatic circuit tester for mass production, 2181, (A) 3198
Marshall, R. W., echo boxes for radar testing, 3592
Martin, A. V. J., operation of klystron, 1271 ; piezoelectric quartz, 2373 ; receiver with automatic tuning and quartz control, 1912 ; u.s.w. techniques, survey, 977
Martin, D. W., i.f. amplifier for high-gain f.m. receiver, 2368
—— and L. J. Anderson, headphone measurements and performance, 1991
Martin, H. B., f.m. mobile services, 2936
Martin, J. H., experimental f.m. broadcast transmitter, 563
Martin, L. W., v.h.f./u.h.f. noise and field-intensity meter, 3582
Martinelli, E. A., with others, excitation of high-Q cavity, (A) 1033
Marton, L., and K. Bol, spherical aberration in magnetic lenses, (A) 1168
Martyn, D. F., r.f. solar radiation, origin, 2088, polarization, 88, thermal, 716 ; solar "static", (D) 3104 ; solar tides in F_2 region, 2421
Maslakovec (Maslakovech), J. P., with others, thermoelectric effect in PbS, 1821
Mason, H. M., with J. W. Black, training for radio or telephone speech intelligibility, 339
Mason, W. P., elastic and electrical properties of $NaClO_3$ and $NaBrO_3$, 752, (A) 3925 ; equations for piezoelectric crystals in tensor form, 3497
—— and H. J. McSkimin, supersonic wave propagation in Al and glass rods, 3393
Massa, F., standard microphone for sound pressure measurement, 333
Massey, H. S. W., discussion on the ionosphere, (D) 3120
—— with D. R. Bates, basic reactions in upper atmosphere, 414
Massignon, D., with E. Bauer, theory of the crystalline field in solid and liquid polar dielectrics, 2736
Mathematical Tables Project, National Bureau of Standards, Tables of Associated Legendre Functions, (B) 163 ; Tables of Spherical Bessel Functions, Vol. 1, (B) 3174
Mather, N. W., clipping and clamping circuits, 4012 ; multivibrator circuits, 56
Mathur, K. N., National Physical Laboratory of India, 2638
Matthews, A. C., field laboratory to simulate home conditions, 228
Matthews, J. B., with others, diffusion from plane surface, 3494
Matthews, L. J., trends in electrical measurement instruments, (A) 316, (A) 1856
Matthias, B., and W. Merz, effect of foreign ions on Rochelle-type crystals, 2800
—— with others, properties and construction of crystal filters, 1696
Mauduit, A., surge waves in overhead lines, 3777
Maurice, D., and R. H. Minns, wide-band r.f. transformers, 3037
Maurice, L., oscillation damping in X-ray transformers, 1225
Maurice, R. D. A., double dipole for 45 and 90 Mc/s simultaneously, [illegible]
Mautner, L., portable television camera chain, 3682
—— with C. J. Creveling, automatic-slideback peak voltmeter for pulses, 2176
Mautner, R. S., and O. H. Schade, television h.v. r.f. supplies, 3674
Maxwell, D. E., automatic gain-adjusting amplifier, 2371
May, E., h.f. induction heating, (A) 1530, applications, 2195
May, L. W., Jr, conversion of BC-624 receiver for λ2m, 4015, of BC-625 transmitter for 144 Mc/s, 3696
Mayer, E., resonant frequencies of re-entrant cavity, 1706
Mazel, W., reactance variation devices, 1391
Meacham, L. A., timer for radar echoes, 3083
Meacham, S. A., transmitter for ground-air communications, 3325
Meahl, H. R., S-band attenuator, 2254
—— with G. E. Feiker, direct reading u.h.f. wavemeters, 3589
Medhurst, R. G., h.f. resistance and self-capacitance of single-layer solenoids, 1694, (D) 3803
Medina, L., no-load loss measurement in transformers, 180
Meeker, W. F., with others, directional characteristics of disk in baffle or horn, 328
Megaw, E. C. S., cm λ propagation over land and sea, 518
Megaw, H. D., crystal structure of titanates, [illegible]
—— with N. J. Dunning, crystal structure of $MgWO_4$, 1462
Meili, E., 1-kW s.w. transmitter, 1616
Mellor, J. W., Higher Mathematics for Students of Chemistry and Physics, with Special Reference to Practical Work, (B) 789
Melvin, M. F., variable inductance tuning for television receivers, [illegible]
Mendoza, E. B., low temperature phenomena, 3847
Menzies, E. B., tracking error plotting, 1569
Mercier, R., extension of Fresnel's formulae, 2387
Merrill, L. L., with M. J. Larsen, capacitance-coupled i.f. amplifiers, 2036
—— with others, directional characteristics of disk in baffle or horn, 328
Merritt, F. R., with C. H. Townes, microwave spectrum of H_2O and D_2O, 693
—— with others, rotational spectra of linear molecules at λ 1 cm, 1732
Merz, W., with B. Matthias, effect of foreign ions on Rochelle-type crystals, 2800
Meschter, E., television reproduction from negative films, 913
Mesnage, P., conductivity of gases excited by h.f. discharges, 1739 ; impedance of gas-filled tubes in h.f. discharge, 1632
Messenger, H. P., and T. J. Higgins, inductance of coaxial busbars, (D) [illegible]
Messner, G. R., with others, rural carrier telephone systems, (A) 3271
[illegible], F., with others, counter tubes, with alcohol vapour, 2748, rapid, pulse shape in, [illegible]
Meyer, C. F., with R. C. Herman, thermoluminescence and conductivity of phosphors, 743, (C) 2797
Meyer, K. P., multiplier as counter for elementary particles, 2860
Meyerhof, W. E., contact potential in Si crystal rectifiers, 3860
Meyers, N. H., and N. R. Schultz, a.c. network analyser, 31
Micheletta, C., propagation characteristics of uniform line, 2670
Middleton, D., rectifier response to random noise, 1565 ; theory of eddy current loss in transformer cores, 2343
—— with J. H. Van Vleck, visual, oral, and recorded reception of pulses, 1919
Mihu (Mihul), V. P., with E. V. Ionescu, induction effect due to negative ions, 3093
[illegible], T., G-M counter with hollow anode, 1870
Milburn, R. H., light-beam communication, 2234
Mildner, R. C., power rating of r.f. cables, (A) 249
Miles, J. W., equivalent circuit for waveguide with plane discontinuity, 634
Millar, J. Z., microwave communication system between New York and Philadelphia, 2924
Miller, F., signal generator for receiver production testing, 3971
Miller, G. A., and S. Mitchell, speech intelligibility at high altitudes, 1983
Miller, H., super-voltage X rays, 2864

Miller, H. A., dimming of fluorescent lighting, 317
Miller, J., with others, masking of speech by standard waveforms, [illegible]
Miller, K. W., with H. A. Adler, probability problems in electrical engineering, 465, (D) 3173
Miller, L. N., front-to-back discrimination of hydrophone, (A) 2307
Miller, P. H., Jr, noise spectrum of crystal rectifiers, 2567
—— with M. H. Greenblatt, electron multiplier, (A) 3976
—— with others, sound field plotter, 3389
Miller, P. M., with H. A. Ross, superheterodyne tracking errors, 3967
Miller, R. H., and E. S. Prud'homme, power-line carrier equipment, 1207, (D) 3272
Miller, S. E., cm radar receiver design, 2562
Miller, V. V., with others, lateral extension of Auger showers, 2765
Miller, W. E., with E. C. Jordan, slot aerials, 1677
Millman, S., and A. Nordsieck, development of rising-sun magnetron anode structure, (A) 296
—— with J. B. M. Kellogg, magnetic resonance method for r.f. spectroscopy, 1731, (A) 3845
—— with others, multi-cavity rising-sun magnetron, (A) 292
Mills, M. M., and R. F. Christy, Auger showers, (A) 2417
Milsom, F. R., with J. H. Reyner, c.r.o. with d.c. amplification, 252
Milton, R. M., with others, superconducting bolometer for infra-red detection, 1527
Milwitt, W., with others, synchronizing-signal generators, 3489
Miner, C. R., front-end design of f.m. receivers, (A) 1188, 3259
Ministry of Supply, Demonstrations of Radio Aids to Civil Aviation, (B) 428
—— Admiralty and Ministry of Aircraft Production, Rubber in Engineering, (B) 2163
Minns, R. H., with D. Maurice, wide-band r.f. transformers, 3037
Minter, J., rhombic television aerials, 26
Mitchell, A. C., geomagnetism, history, 411
Mitchell, C. J., Introduction to Transmission Lines, (B) 2018
Mitchell, H. T., B.B.C. television channels in London, 2666
Mitchell, S., with G. A. Miller, speech intelligibility at high altitudes, 1983
Mitra, S. C., and S. R. Khastgir, interelectrode capacitances of triodes, 1501
Mitra, S. K., geomagnetic control of F_2 region, 728
Mittlemann, E., h.f. heating, frequency constancy, (A) 1154, 3221
Mix, D., with others, 1-kW transmitter, 3.5–30 Mc/s, 3326
Model, Z. I., power addition in valve oscillators, 3826
Moelwyn-Hughes, E. A., with others, diffusion from plane surface, 3494
Moffett, L. R., with others, naval airborne television reconnaissance system, 2960
Moir, J., distortion and acoustic preferences, (D) 2656 ; perfect *vs* pleasing reproduction, 1185, (D) 2554
Moles, A., automatic regulation in electroacoustics, 3767 ; dead rooms for acoustic tests, 988 ; microphone, characteristics, measurement, 1308, standard, and regulator for acoustical measurements, 1306 ; room acoustics, 2313
Moll, J. L., with L. Malter, waveguide output magnetrons with quartz transformers, 2712
Møller, C., relativistic quantum theory, 686
Molloy, E., (Ed), British Catalogue of Plastics, (B) 3949
Monack, A. J., glass-to-metal seals, 119, 431 ; metallizing glass and ceramic materials, 1480
Moncrieff-Yeates, G. B., periodógraph, 3586
Mondon, R., electrolytic polishing, 2151
Montel, É., mobility and diffusion of ions, 702
Montgomery, B., 75-Mc/s aircraft marker systems, (A) 1089, 3143
Montgomery, C. G., and D. D. Montgomery, cosmic ray showers, (A) 3882 ; transition effect for large cosmic-ray ionization bursts, 3890
—— with others, cavity accelerator for electrons, 3999 ; de-ionization of t.r. switches, 1633
Montgomery, D. D., with C. G. Montgomery, cosmic ray showers, (A) 3882 ; transition effect for large cosmic-ray ionization bursts, 3890
Monti-Guarnieri, G., a.f. reactors and transformers, 2694
Moody, R. C., with F. L. Hopper, sound recording transmission system, 344
Mookherji, A., magnetic properties of crystalline Ni salts, 399
Moon, J. H., radiogoniometers for m.f. d.f., 2127, (A) 3133
Moon, P., and D. E. Spencer, international suffixes in scientific nomenclature, 597
Moore, D. W., Jr, continuously variable radio remote control, 682 ; electronic position pickup, 1511
Moore, G. E., with others, paramagnetic resonance absorption of salts at 9000 Mc/s, (A) 3866
Moore, J. H., P. K. Seyler and S. B. Wright, R/T for rural communities, 3659
Moore, L. H., harmonic frequencies, 2491
Morack, M. M., large electronic d.c. motor drives, (A) 1154, 3209
Moreland, H. D., electronic timing of X-ray exposures, 3246
Moreno, T., and O. C. Lundstrom, microwave power measurement, [illegible]
Morgan, J. M., electronic contour controller, 207, (A) 1154, 3227
Morgulis, N. D., electron emission from semiconducting cathodes, 1062 ; positive ion emission in valves, 744
Morize, P., and P. Lacombe, oxidation of Al by air, 130
Morozov, I. I., hermetic paper capacitors, 3810
Morris, A. L., toroidal transformers, 3439
Morris, J., Escalator Method in Engineering Vibration Problems, (B) 2167 ; solution of simultaneous equations by escalator process, 463
Morris, L., selective-calling systems in mobile radio communication, 3286
Morris, R. J., with others, plastic optical and infra-red filters, 3541
Morris, R. M., with others, s.w.r. meter for coaxial lines, 3196
Morrison, H. L., pulse width and slope measurement, 3567
Morrison, P., physics in 1946, 2725
Morrison, W. C., with G. H. Brown, RCA antennalyzer, 1337
Morrow, M. G., coronograph, 400
Morse, M., sound embossing at high frequencies, 1986
Morton, G. A., electron guns for television, 1968
—— and L. E. Flory, infra-red image tube and military applications, 2361
—— with others, Electron Optics and the Electron Microscope, (B) 1174
Morton, P. L., ionization currents in non-uniform electric fields, 1408
—— with L. J. Black, current and power in v.m. tubes, (D) 2272
Moseley, F. L., and C. B. Watts, automatic radio flight control, (A) 1089, 3141
Moskowitz, S., and D. D. Grieg, pulse modulation noise suppression, (A) 3269
—— with D. D. Grieg, multiplex u.h.f. broadcasting, 3277
—— with others, cyclophon beam-switching tube, (A) 1258
Moskvin, A. V., cathodoluminescence, 2062
Moss, H., amplitude modulation, 1216 ; c.r. tube design simplification, 300
—— with others, war-time developments in c.r. tubes for radar, 2983
Moss, S. H., with M. Reed, interference and channel-frequency assignment, 241, (A) 1215
Mott, B. W., with K. G. Robinson, surface hardening of Al and alloys, [illegible]
Motz, H., h.f. resonator cavities, calculation of parameters, 52, (A) [illegible]
—— and W. D. Worthy, magnetic field calculations by relaxation method, (D) 156
Moubis, J. H. A., with others, cathode sputtering in gas discharge tubes, 592
Moulic, W., with R. R. Batcher, Electronic Control Handbook, (B) 2543
—— with others, Electronic Engineering Handbook, (B) 2544
Moullin, E. B., field of coil between two metal sheets, 2077, (A) 3502 ; radiation from large circular loops, 24, (A) 1012
Mourmant, P., measurement of h.f. voltages of order of 1 μV, 1500
Mouromtseff, I. E., quarter century of electronics, 2615
Moussiegt, J., ignition time constant of gas discharge, 2287 ; intermittent discharge in valves, analysis, 940, current [illegible], 941
Moxon, L. A., frequency variation of r.f. cosmic noise, 1078 ; noise factor, definition, 864, measurement, 1196, discussion, 2919
Mrowca, B. A., with others, dielectric properties of rubber, (A) 3167
Muehlhause, C. O., and H. Friedman, G-M counter for high counting rates, 1876
Mueser, R. E., with P. Ebaugh, reciprocity calibration of underwater transducers, 3768
Muffly, G., airborne magnetometer for oil prospecting, 1374
Mukerjee, G. C., with S. S. Banerjee, s.w. fading on 700-km path, 853
Mulders, E. S., with S. B. Nicholson, solar and magnetic data, July–Sept. 1946, 1755, Oct.–Dec. 1946, 3102
Mull, S., and Y. P. Rao, pressure fall below thunderclouds, 730
Mullen, J. B., and P. L. Howard, AgCl-Mg water-activated battery, 3295
Muller, F. A., and K. Zimmerman, attenuation test equipment for v.h.f. transmission lines, (A) 2490
Muller, J. J., cathode-excited linear amplifiers, 2037
Müller-Strobel, J., public address systems, 1314 ; radiation impedance and aerial shortening of transmitter-dipole, 1344
—— and J. Patry, aerial auxiliary functions, 22 ; receiving dipole aerial, 1334
Mullin, C. J., striking of thyratron arcs, 1638
Mulvey, B., testing film continuity on fine wire, 822
Mumford, A. H., discussion on the ionosphere, (D) 3120
Mumford, W. W., directional couplers, 2007
Mundel, A. B., with others, midget earphones for military use, 347
Mura, A., G. Salvini and G. Tagliaferri, penetrating component in cosmic-ray showers, 2764
Murard, R., interpretation of de Broglie's photon equations, 1395
Murray, A. F., printed circuits, 3080
Musselman, G. H., ionosphere equipment for field use, 2929
Musson-Genon, R., graphical determination of electron trajectories in electric field, 697
Myers, S. B., parallel plate optics for rapid scanning, 2679
Mynall, D. J., electrical analogue computing, 3563

N

Nagy, R., and Chung Kwai Lui, thermal and X-ray analysis of phosphors, 3539
Naismith, R., 6-m transatlantic signals, 2899
—— with E. V. Appleton, radio detection of meteor trails, etc., 1752, 3874
National Bureau of Standards, classification of radio subjects, 607
National Research Corporation, radioactive ionization gauge, 117
Nature, absolute electrical units, 2833 ; advanced practical mathematics, 1490 ; British Commonwealth scientific cooperation, (D) 2636 ; broadcasting in Great Britain (A) 320 ; f.m. B.B.C. field trials, (A) 2238 ; German scientific and technical papers, photostat service, 4091 ; marine navigation, radio aids, 3134 ; microfilm documentation, 964 ; research and the smaller firm in Britain, 962 ; scientific information services, 595 ; sunspots, March 3–17, 1947, 2760, March 31–April 13, 1947, 3510 ; work at National Physical Laboratory, 309 ; World List of Scientific Periodicals, 1653
Navias, L., and R. L. Green, dielectric properties of glasses at u.h.f., 452, (A) 1114
Neale, R. E., (Ed), Whittaker's Electrical Engineer's Pocket Book, (B) 322
Needham, W., with others, SiC non-ohmic resistors, 141, (D) 1115
Néel, L., coercive field calculation, 1744 ; ferromagnetic powders, 3151, 3152
Neil, J., sound-on-film recorders, 9
Nelson, J. B., and J. H. McKee, cerium tungstate as semiconductor, 1112
Nelson, J. H., super-finish of metal surfaces, 1483
Nelson, P. H., aerial model construction, (A) 2011
Nelson, R. B., magnetron, 5-kW c.w. at 1050 Mc/s, 3735
—— with R. V. Langmuir, magnetron with water-cooled cathode, (A) 295
Nethercot, W., recording of transients, 545
Nettleton, L. A., and F. E. Dole, potentiometers, improvement of performance, 1691
Neubauer, E. T. P., nuclear power-plant engineering, (A) 1154, 3208
Neumann, H., magnetic fields for measuring purposes, 165
Newbound, R., with F. Widnall, protective finishing of electrical equipment, (A) 3543
Newell, H. E., Jr, V-2 rocket investigations of upper atmosphere, 3901
Newlon, A. E., pulse transmission in amplifiers, 51
Newman, E. B., with J. C. R. Licklider, artificial atmospherics for receiver tests, 3639
Newmark, M., Dictionary of Science and Technology, (B) 983
Newton, C. C., with others, gyro interaction of radio waves, 2897
Newton, H. W., magnetic storms and solar activity, 1946, 1754
Ney, E. P., power spectrum of cosmic-ray cascade component, 96
Nguyen, Thien-Chi, compressed kovar, 1479 ; electron diffraction tests in valve industry, 2617 ; transformation of anatase into rutile, 138
Nichols, R. H., Jr, and others, noise reduction in aircraft, 3405
Nicholson, M. G., comparison of a.m. and f.m., 3660
Nicholson, S. B., solar and magnetic data, Jan.–March 1947, 3876
—— and E. S. Mulders, solar and magnetic data, July–Sept. 1946, 1755, Oct.–Dec. 1946, 3102
—— with O. R. Wulf, tidal motions of the atmosphere, 3900
Nicolet, M., atmospherics, (A) 2758 ; Contribution à l'Étude de l'Ionosphère, (B) 420 ; ionosphere, (A) 2758 ; solar and galactic noise, (A) 2758
Nicolle, G., telephone transmissions in noisy surroundings, 2663
Nield, P. N., RC a.f. filter, 2053
Nielsen, C. E., magnetic field with small axial variation, (A) 1117
Nielsen, H. H., and D. M. Dennison, anomalies in microwave spectrum of NH_3, 3871
Nielson, R. A., effect of frequency in induction heating, [illegible]
Nier, A. O., mass spectrometer applications, (A) 1154, [illegible]
—— and others, mass spectrometer for leak detection, 2441
Niessen, K. F., measurement of electrical constants of ground, 3893 ; radio beacon errors in tilted aeroplane, 118
Nikitin, S., with others, cosmic rays at 8 km height, [illegible]
Nikolaevskaya, N., with A. Zingerman, mechanism of discharge, 699
Nikolsky, A. P., terrestrial magnetic variations, 3897
Niland, J. A., teleguided missiles, 2539
Nims, P. T., with O. E. Bowlus, electronic frequency changers for [illegible], 3039
Niven, C. D., organic thermistor bolometer, 1518
Nixon, G. M., recording studio design, 3010
—— and H. M. Gurin, criteria for studio design, (A) 2307, 3411
—— and J. Volkmann, recording studio design, 2314
Nobles, C. E., stratovision communication, (A) 1239, [illegible]
Nodia, M. Z., magnetic observations survey at Tiflis, [illegible]
Nolle, A. W., physical constants of synthetic rubbers, [illegible]
Noltingk, B. E., d.c. amplifier with modulated carrier, (D) 1048
Nordberg, M. E., ultraviolet-transmitting glasses, 3556
Nordsieck, A., with S. Millman, development of rising-sun magnetron anode structure, (A) 296
Norinder, H., thunderstorms, e.m. effects, 3907
—— and W. Stoffregen, nature and variation of atmospherics, 1784
Norrman, E., LC oscillator as frequency divider, 817
North, H. Q., welded-contact Ge rectifiers, 2276
North, W. L., improvements in RME-69 receiver, 3635
Norton, K. A., systematic errors in radio navigation systems, 2429
—— and A. C. Omberg, maximum range of radar set, 2130
Norton, R. L., crystal-controlled diathermy, 486
Norton, S. G., with others, counting rate and frequency meter, 480
Nowotny, W., signal noise ratios for principal modulation systems, 4029
[illegible], R. G., and H. M. Frent, ultrasonic leak detection in hydraulic systems, 3803
Nutting, P. G., second law of thermodynamics, 695
Nyborg, W. L., with J. S. Saby, ray computation for non-uniform sound fields, 329
—— with others, supersonic propagation in open air, 1339
Nye, L. C., with D. S. Robertson, RC beat-frequency oscillator, 672

O

Oakes, W. G., breakdown strength of polythene, 2146
—— and R. B. Richards, dielectric properties of chlorinated polythenes, 2813
Oberly, J. J., with others, ultraviolet solar spectrum up to 88 km height, 1421
O'Brien, B., development of infra-red sensitive phosphors, 120
O'Brien, R. S., paper tape recorders for broadcasting, 3773
Odgers, G. J., structure of sunspots, 2091
Offner, F. F., balanced amplifiers, 2370
Ogg, A., periodicity of geomagnetic activity, 1771
Ohl, R. S., with J. H. Scaff, development of Si crystal rectifiers, 4085
Ojemann, R. H., cultural appreciation of scientific approach, 959
O'Leary, A. J., relativistic misconception, (D) 685
Oliphant, M. L., Rutherford and modern world, 3366
Olive, G. W., television in Canada, 2266
Ollard, E. A., electroforming, survey, 1478, 2462
Olsen, L. O., with others, B-H meter for small cross-sections, 1853
Olsen, R. K., with G. E. Hamilton, transmission line measurements in television aerial design, 2262, 3303
Olson, H. F., frequency range preference for speech and music, 3765 ; mechano-electric transducer, (A) 2307, 3413 ; sound absorbers, 3005
—— and J. Preston, duo-cone loudspeaker developments, 993, 2664
Omberg, A. C., with K. A. Norton, maximum range of radar set, 2130
Oosterkamp, W. J., with W. H. Boldingh, 400 kV X-ray equipment, 3617
Oppenheimer, J. R., with H. A. Bethe, radiation and electron scattering, 701
Orchard, F. C., Electricity in Building Industry, (B) 1298
Ortusi, J., filtering of guided waves, 1673 ; reflection coefficients in waveguides, 3788
Ory, A., television in France, (C) 2265
Osborne, M. F. M., and S. D. Hart, elastic wave propagation, 1
Osipov, N. V., u.s.w. radio observations during solar eclipse of 9th July 1945, 2096
Ostrovski, I. E., with S. Ya. Braude, propagation of u.s. waves in line of sight, 2549 ; secondary emission in magnetrons, [illegible]
Ovrebo, P. J., and H. L. Kraybill, cosmic-ray showers, (A) 3882
Owen, D., lines of force through neutral points in magnetic field, [illegible]
Owen, R. P., linear sweep circuits, 1040
Owens, C. D., insulation for h.v. pulse networks, 1477

P

Pacella, B. L., with M. Conrad, simplified encephalophone, 2350
Packard, L. E., Z meter, 1142
Padgett, E. D., airline radio service, 533
Pain, D. H., P.I.C.A.O. instrument landing specifications, 2436
Paine, H. G., with H. E. Dinger, accuracy of noise meters, 2227
Paine, R. C., universal chart for unbalanced bridge, 807
Pakswer, S., fatigue of photoelectric surfaces, 2971
Palluel, P., secondary electron emission, 2750
Palm, C., intensity fluctuations in telephone traffic, 869
Pancini, E., with others, absorption and disintegration of mesons, 3885
Panofsky, W. K. H., cavity resonator field strength measurement, (A) 1131
—— with others, excitation of high-Q cavity, (A) 1033
Panoramic Radio Corporation, panadaptor, 521
Paolini, E., acoustical tests in the Scala theatre, Milan, 3406
Papalexi, N. D., radio observations during solar eclipse of 9th July 1945, conclusions, 2092 ; scientific problems of contemporary radio, 3374
Paranjpye, B. H., with others, rhombic aerials and matching circuits for reception, 1678
Parker, W. L., with R. T. Ellickson, infra-red sensitive phosphors, 1456
Parliman, J. H., low-loss plastics, 3931
Parodi, M., active and reactive power of dissipative network, 2700 ; circuits with n degrees of freedom, 43 ; conditions for common frequencies in ladder-type filters, 2028 ; propagation, in cable with only resistance and capacitance, 628, along lines with undistorted parameters, 635 ; propagation of plane elastic waves in heterogeneous medium, 2056
—— and F. Raymond, variable capacitors, 1367
Parrack, A. L., with E. W. Jensen, chemical applications of h.f. oscillators, 1893
Parry, C. A., high-impedance input a.f. circuits, 1715
Parsegian, V. L., high-speed recording potentiometer, (A) 2248
Parzen, B., and A. Yalow, theory and design of reflectometer, 3968
Parzen, P., resonant frequencies of [illegible] circuits, 2352
Patchett, G. N., nonlinear bridge circuits, theory, 44, incandescent lamps in, 45
Paterson, C. C., diamond dies, 774 ; future trends in radio communication, (A) 4096
Patry, J., with J. Müller-Strobel, aerial auxiliary functions, 22 ; receiving dipole aerial, 1334
Pattison, H. O., Jr, R. M. Morris and J. W. Smith, s.w.r. meter for coaxial lines, 3196
Pawsey, J. L., solar thermal radiation at λ 1.5 m, 717
Payne, N. E., with W. F. Leidel, Jr, variable reluctance gramophone pickup, (A) 7
Pearce, R. R., screens with h.f. spaced-loop d.f., (A) 2128, 2784, (A) 3530
Pearce, S. F., interference suppression, 2922
Pearlman, D., with others, infra-red-sensitive phosphors, 121
Pearsall, C. S., with others, de-ionization time of t.r. switches, 1633
Pearson, G. L., and W. Shockley, Hall effect and resistivity of Ge and Si from 10° to 600° K, (A) 2452
—— with others, properties and uses of thermistors, 786, 3552
Pearson, H. A., and others, midget earphones for military use, 347
Peierls, R. E., fundamental particles, survey, 1400
Pekar, S. I., metal semi-conductor contact potential, 3828
Pekeris, C. L., microwave propagation, non-standard, perturbation theory, 507, normal-mode theory, 2214, in W. Indies, 2906
Pelzer, H., with A. E. W. Austen, electric strength of paraffins and polymers, 784
Peng, H. W., with M. Born, quantum mechanics of fields, 687
Penin, F., amplidynes, industrial applications, 821, and selsyns, 2584
Penley, W. H., with D. Taylor, scanning equipment for ground radar, 738
Penn, W. S., teflon, 3559
Penndorf, R., stratosphere, structure, 3517, thermal structure, 3516
Penners, B. A., and W. Davis, design of electronically regulated power supplies, 2947
Penning, F. M., v.m. valves, 3353
—— with others, cathode sputtering in gas discharge tubes, 592
Penrose, R. P., dielectric properties of low-loss solids at 25000 Mc/s, 2846
—— with B. Bleaney, microwave absorption spectrum of NH_3, 3507, 3870
—— with others, cavity resonators for measuring cm waves, 3187
Pensa, P., vacuum pumps, 1102
Pepinsky, R., electronic computer for crystal structure analysis, (A) 3864
Perkin-Elmer Corporation, contact modulated amplifier, 1512
Perkins, W. T., and R. W. Barton, Radio Communications, (B) 325
Perlow, G. J., cosmic rays, V-2 rocket tests, (A) 3882
—— and J. D. Shipman, Jr, non primary cosmic-ray electrons above earth's atmosphere, 2762
—— with others, cosmic radiation at great heights, 94
Perrier, F., scanning device for luminous-spot measuring apparatus, 798

Perusquia, M. L., with others, cosmic radiation, energy spectrum, (A) 1434
Pesarevsky, A. M., nonlinear distortion in class-B amplifiers, **4019**
Peters, B., with E. J. Lofgren, f.m. cyclotron and deflector problem, (A) **1161**
Peters, C. G., and others, electrical methods for diamond-die production, **3944**
Peters, R. G., railway R/T, **885** ; v.h.f. propagation surveys, **3630**
Petersen, R. P., with others, cosmic rays, methods of V-2 rocket tests, (A) **3882**
Peterson, A. C., Jr, mobile R/T system, **3285**
Peterson, E., coil pulsers for radar, **674**
—— with J. M. Manley, negative resistance effects in saturable reactor circuits, **2652**
Peterson, J., acoustical design of broadcasting studios, **2659** ; train communications, **1589** ; WNEW programme control system, **3294**
Peterson, J. M., with others, synchrotron r.f. system, (A) **1165**
Peterson, N. J., broadcast studio control unit, **1220**
Petiau, G., densities of mean values in Dirac's electron theory, **1394**
Petralia, S., and R. Ricamo, push-pull amplifier with direct coupling, **2049**
Petrich, R. O., 550-Mc/s amplifier, (A) **3480**
Petrocokino, D., earthing of electrical installations, **3834**
Petropoulos, G. M., current distortion due to nonlinear impedance, **185**
Pettit, J. M., receiver sensitivity at h.f., **2568**
—— with F. E. Terman, compensated-loop direction-finder, (C) **2431**
Peychès, I., electrical fusion of glass, **775**
Peyser, W. P., with O. H. Schmitt, aircraft aerial pattern plotter, **2684**
Pfann, W. G., electrolytic pointing of tungsten wires, **3240**
Pfleger, K. W., with T. A. Jones, relative merits of carrier telegraphy methods, **528**
Phélizon, G., with A. G. Clavier, R/T circuits, **540**
Phelp, N., and F. Tappenden, timer for photo-printing, **200**
Philippe, P., perspective in television projection, **1242**
Phillips, F. S., with others, rapid-response bolometers, **1730**
Phillips, M., and W. E. Lamb, Jr, space-charge/frequency dependence of magnetron cavity, (A) **290**
—— with W. E. Lamb, Jr, space-charge/frequency dependence of magnetron cavity, **2989**
—— with others, radar reflections from long conductors, **1687**
Picard, R. G., and J. H. Reisner, electron microscope as diffraction camera, **1169**
—— with others, resolution in electron microscope, committee report, **1889**
Piccioni, O., with M. Conversi, slow mesons, mean life, **2105**, disintegration, **2106**
—— with others, absorption and disintegration of mesons, **3885**
Picht, J., and J. Himpan, electric deflection of electron beams, (A) **1603**
Pickard, G. W., and H. T. Stetson, tropospheric reception, (A) **3634**
Pickett, E. E., with others, plastic optical and infra-red filters, **3541**
Pidduck, F. B., Currents in Aerials and High Frequency Networks, (B) **28**
Pielemeier, W. A., with others, supersonic propagation in open air, **1989**
Pierce, E. T., solar flare and radio fade-out, **3881**
Pierce, J. A., hyperbolic navigation, (A) **735** ; ionization by meteoric bombardment, **2408** ; true height of ionosphere layer, **3902**
Pierce, J. R., beam travelling-wave valve, **1262** ; reflex oscillators, (A) **673** ; travelling-wave valves, theory, **2284**
—— and L. M. Field, travelling-wave valves, construction, **2285**
Pihl, G. E., measuring complex components of voltage, **1860**
Pike, E. W., with others, coding radiosonde, (A) **3984**
Pincherle, L., refraction between absorbing media, **2729**, **4005**
Pinder, K., induction and dielectric heating, **2514**
Pineo, V. C., with others, radio observations on meteors, 9th Oct. 1946, **854**
Pinney, E., e.m. fields in paraboloid reflector, **2687**
Pinot, H., oscillator for television sound channel test, **2359**
Pippard, A. B., O. J. Burrell and E. E. Cromie, re-radiation and aerial power gain measurements, **1345**
—— with J. Ashmead, spherical reflectors as microwave scanning aerials, **1342**
Piraux, H., vacuum technique, survey, **742**
Pirenne, M. H., Diffraction of X Rays and Electrons by Free Molecules, (B) **1749**
Pisarenko, N. L., thermomagnetic Nernst effect in semiconductors and metals, **1815**
Planck, C. E., C.A.A. instrument landing system, **1792**
Plessner, K. W., and R. B. Richards, dipole orientation in solutions of esters in polyisobutene and polystyrene, **2814**
Plion, P., evacuation of small transmitting valves, **1260**
Poch, W. J., with M. A. Trainer, television equipment for aircraft, **3309**
Pocock, L. C., microphones and receivers, **1659**
Pohl, R., magnetization of sheet steel, **3542**
Polkinghorn, F. A., with others, multichannel microwave radio relay system, **1219**, (A) **4033**
Polydoroff, W. J., permeability tuning in f.m. band, **1718**
Pomeranchuk, I., with L. Arzimovich, radiation of fast electrons in magnetic field, **2732**
Pomerantz, M. A., magnetron cathodes, **1270**
Ponomarev, M. I., phase-integral method for propagation problems, **2546**
Ponte, M., French contribution to radar, **1099**, **1796**
Popper, P., with others, Curie point of $BaTiO_3$, **3930**
Poptzov, N., and L. Tchernikova, properties of polycrystalline ferromagnetic substances, **2075**
Porter, N. E., with J. M. Fluke, infra-red communication components, **1230**
Post, R. F., with others, underwater sound propagation at l.f., (A) **2307**
Potier, G., multiplex pulse communication systems, **4031**
Potts, W. C., ships' magnetic field and degaussing, **841**
Pound, R. V., electronic frequency stabilization of microwave oscillators, **1690**
Pout, H. W., precision radar ranging systems, **1799**
Powell, W. M., measuring small changes in alternating magnetic field, (A) **1160**
Powles, J. G., with W. Jackson, dielectric absorption in benzene and liquid paraffin at u.h.f., **2841**
Prache, P. M., power reflection, **3783**
Prakash, B. N., negative impedance measurement with *Q* meter, **1849**
du Pré, F. K., with M. Gevers, power factor and temperature coefficient of solid amorphous dielectrics, **2798**
Preston, J., with H. F. Olson, duo-cone loudspeaker developments, **993**, **2664**
Preston, J. S., galvanometer amplifier with negative feedback, (D) **1513**
Price, G. H. S., powder metallurgy bibliography, **3941**
Primakoff, H., and L. L. Foldy, electroacoustic transducer theory, **1990**
—— and others, sound diffraction round circular disk, **1978**
Prime, H. A., medium-precision radar ranging systems, **1800**
Prins, D. G., galvanometer amplifier with negative feedback, (D) **1513**
Pritchard, H. C., blind-landing problems, survey, **1093**
Prokhorov, A. M., with others, frequency stabilization theory, **363**
Prud'homme, E. S., with R. H. Miller, power-line carrier equipment, **1207**, (D) **3272**
Pryce, M. H. L., wave guides, survey, **353**
Pugsley, D. W., postwar television receivers, (A) **2594**
Puleston, R., with others, war-time developments in c.r. tubes for radar, **2983**
Pullin, V. E., survey of engineering radiography, **1890**
Pumphrey, F. H., Electrical Engineering, (B) **2653**
Purinton, R. M., focusing a transmission tube, **3437**
Pushkov, N. V., with J. V. Leshchinsky, work of Ionosphere Bureau, **2419**
Pye, C. R., insulating films, (D) **140**

Q

Quarmby, R. B., with N. C. Stanford, characteristics of r.f. cables, [illegible] **174**
Queffelec, J., triode oscillators, **2042**
Querzoli, B., with others, electron component of cosmic rays in lower atmosphere, **3886**

R

Racah, G., self-energy of electron, **1401**
Rader, L. T., a.c. magnets and solenoids, **3293**
Radio Component Manufacturers' Federation, Radio Components for Export, (B) **2055**
Radio Corporation of America, vibrotron valves, **584**
—— Laboratories Division, colour television, **3297**
Radio Society of Great Britain, Service valve equivalents, **1259**
Radley, W. G., G.P.O. telephony and telegraphy developments, **1206**
Rado, G. T., M. H. Johnson and M. Maloof, complex permeability of magnetic iron at 200 Mc/s, (A) **3183**
—— with others, complex permeability, of iron at v.h.f., **3182**, of metals at u.h.f., (A) **2852**, of permalloy, (A) **3923**
Rado, J. A., A. M. Levine and M. G. Hollabaugh, feedback amplifiers, (A) **3483**
Ragazzini, J. R., R. H. Randall and F. A. Russell, analysis of problems in dynamics by electronic circuits, **2827**
Rajachman, J., 'selectron' e.s. memory valve, (A) **3712**
Rajchman, J. A., and W. H. Cherry, electron mechanics of betatron, **3997**
Rajeswari, —, and S. P. Chakravarti, extension of band-pass effect at h.f., **1720**
—— with S. P. Chakravarti, band-pass effect in crystal resonator, **1221**
Rakshit, H., and K. K. Bhattacharyya, 3-phase RC oscillator, **2356**
Ralph, J. T., and H. M. Wood, BC-645 transmitter-receiver, **1957**
Ramadier, J., dispersion of optical glass in near infra-red, **2060**
Ramberg, E. G., with J. Hillier, magnetic electron microscope objective, **2530**
—— with others, Electron Optics and the Electron Microscope, (B) **1174**
Ramberg, W., vacuum-tube acceleration pickup, **2528**, **4001**
Rambo, W. R., f.m. of h.f. power oscillators, (A) **1026**, **3055**
Ramsay, J. A., with M. V. Wilkes, radar and ship targets, **2904**
Ramsay, J. F., Fourier transforms in aerial theory, **2680**, **3561**
Ramsayer, K., aneroid barometers as altimeters, **968**
Ramsey, R. R., Experimental Radio, (B) **609**
Randall, R. H., with others, analysis of problems in dynamics by electronic circuits, **2827**
Randell, B., 1.7–28 Mc/s transmitter, **1620**
Rangachari, T. S., B. H. Paranjpye and G. S. Deshpande, rhombic aerials and matching circuits for reception, **1678**
Rao, Y. P., with S. Mull, pressure fall below thunderclouds, **730**
Rapp, L. E., staggering band theorem, **2941**
Rappaport, G., with S. L. Ackerman, radio control systems for guided missiles, **1172**
Rapuano, R. A., supersonic absorption in liquids, at 75–280 Mc/s, **3752**, at 100–225 Mc/s, (A) **3753**
Raske, W., voltage measurement using sphere gap, **476**
Ratcliff, J. G., v.h.f. signal generator or frequency meter, **3588**
Ratcliffe, J. A., aerials for radar equipment, survey, **358**
Ratcliffe, R. A., with E. M. Fanker, f.m. v.h.f. receivers, testing procedure, **2912**
Rathbun, M. E., M. J. Eastwood and O. M. Arnold, supplementary bibliography of electron microscopy, **1546**
Ratheiser, L., transit-time effects and transit-time valves, **1645**
Rathenau, G. N., and J. L. Snoek, apparatus for measuring magnetic moments, **166**
Rauch, L. L., telemetry for aircraft flight test recording, **1825**
Rawcliffe, D., and R. W. Dressel, magnetic focusing and deflection in c.r. tubes, **303**
Ray, H. A., Jr, calculator for directional aerial systems, **1014**
Ray, J. N., with others, h.f. and m.f. properties of Indian soils, **1900**
Raymond, F., generalization of rejector filters, **1371** ; propagation of e.m. signal along heterogeneous line, **1008**
—— with M. Parodi, variable capacitors, **1367**
Raymond, F. H., similitude of valves, **3333**
Rea, W. T., telegraph distortion measurement, **3192**
Read, A. A., with others, electrical engineering aspect of degaussing, **842**
Read, C., with B. Halligan, receiver using split-stator circuit, **522**
Read, O., radio-controlled aircraft for atomic bomb observations, **497** ; sound recording and reproduction, survey, **3771**, **3772**
Reber, C. M., radar for meteorological observation, **3129**
Reber, G., cone and cylindrical aerials with mirrors, **3426** ; solar radiation at 480 Mc/s at Illinois, **1760**
—— and J. L. Greenstein, cosmic and solar r.f. radiation, **1757**
Redgrave, G. F., perfect *vs* pleasing reproduction, (D) **2554**
Redston, G. D., and J. E. Stanworth, glass-to-metal seals, **1465**
Reed, M., and S. H. Moss, interference and channel-frequency assignment, **241**, (A) **1215**
Reed, R. I., with H. D. Wells, f.m. and television power valve and grounded-grid cavity, (A) **3337**
Reed, R. R., 3-cm resonant cavity, (A) **3466**
Reedy, P. H., television relaying, (A) **3298**
Rees, A. L. G., with J. M. Cowley, refraction effects in electron diffraction, **395**
—— with others, ZnS phosphor with ultraviolet excitation, **3919**
Regen, B. R., and R. R. Regen, German-English Dictionary for Electronics Engineers and Physicists, (B) **4103**
Regen, R. R., with B. R. Regen, German-English Dictionary for Electronics Engineers and Physicists, (B) **4103**
Regenstreif, E., with F. F. Bertein, aberration of e.s. lenses due to ellipticity, **2531**
Reich, H. J., cathode-follower input admittance, **3064**
Reichenbach, H., Philosophic Foundations of Quantum Mechanics, (B) **321**
Reid, D. G., gain of idealized Yagi array, **1349**
Reiffel, L., and K. Rothschild, pulse converter, **3446**
Reisner, J. H., with R. G. Picard, electron microscope as diffraction camera, **1169**
Reiter, R., radiation measurement apparatus, **1523**
Rekalova, G. I., with P. S. Tartakovsky, inner photoelectric effect in sulphur and electronic energy levels, (A) **1828**
Remscheid, E. J., with C. C. Herskind, operation of ignitrons, **574**
Renaud, P., and H. Frisby, electron diffraction by electrolytically polished copper, **768**
Rendall, A. R. A., variable oscillators, **666**
Renfrew, M. M., and E. E. Lewis, polytetrafluorethylene, **149**
Replogle, F. S., Jr, and V. M. Albers, 4-channel electronic switch, **3445**
Retief, D. P. J., communications network, South Africa, **3651**
Rettinger, M., convex wood splays for studios, (A) **2307**, **3416**
—— and K. Singer, frequency response of film sound-track, **995**
Reyner, J. H., and F. R. Milsom, c.r.o. with d.c. amplification, **252**
Rhines, F. N., with T. E. Leontis, high-temperature oxidation of Mg and Mg alloys, **2456**
Riabouchinsky, D., Maxwell's equations, and dynamics of aether, **691**, mechanical explanation, **690**
Ribaud, G., eddy currents in ferromagnetic disk, **650** ; energy dissipation by hysteresis and eddy currents, **703**
Riblet, H. J., current distribution for broadside arrays, (D) **2685** ; microwave omnidirectional aerials, **2678**
Ricamo, R., with S. Petralia, push-pull amplifier with direct coupling, **2049**
Rice, C. W., flow of electrons and ions between concentric cylinders, **394**
Rice, P. J., with others, cavity accelerator for electrons, **3999**
Richard-Foy, R., with others, cosmic rays, high-energy protons, **719**, unusual particles, **722**
Richards, P. I., coupled resonator frequency response, **54**
Richards, R. B., dielectric properties of high polymers, **2812**
—— with W. G. Oakes, dielectric properties of chlorinated polythenes, **2813**
—— with K. W. Plessner, dipole orientation in solutions of esters in polyisobutene and polystyrene, **2814**
Richardson, E. G., supersonic vibrations, and applications, **987** ; velocity of sound, theory, **2**
Richardson, H. M., plastics in 1946, **3948**
Richardson, J. R., with B. T. Wright, f.m. cyclotron characteristics, (A) **1164**
Richmond, A. E., preamplifier noise in f.m. broadcasting, **4063**
Richter, W., Fundamentals of Industrial Electronic Circuits, (B) **3490**
Riddiford, L., with W. B. Lasich, 2.8-MeV betatron, **4000**
Rider, J. F., Inside the Vacuum Tube, (B) **306**
—— and G. C. B. Rowe, Radar—What It Is, (B) **2134**
Rieke, J. W., low-altitude radar bombsight, **1457**
Riesing, E. F., and J. O. Callouette, rubber in 1946, **3947**
Riesz, R. R., and L. Schott, c.r. tube for visible speech, (A) **3398**
Rife, W. E., models for d.f. aerials, (A) **2011**
Rifkin, M. S., cathode-coupled amplifier, **3066**
Rigrod, W. W., with D. E. Marshall, characteristics of resistance ignitors, **2945**
Rigterink, M. D., and R. O. Grisdale, porcelains with low dielectric loss, **3550**
Rik, G. R., electron optics of Kubetski electron multiplier, **569**
Riley, G., emergency broadcast pickup techniques, **2940**
Ringo, G. R., J. W. Fitzgerald and B. G. Hurdle, propagation of pressure waves in Hg at 100 to 1000 Mc/s, **3755**
Ritson, D. M., with others, dielectric properties of water, **2844**
Ritson, F. J. V., with F. C. Williams, electronic servo simulators, (A) **4039**
Rivlin, R. S., Campbell's theorem of random fluctuations, **29**
Roberts, F. F., fault location in h.f. cables, **1002**, (A) **1663**
Roberts, H. C., carrier-type amplifier for electric gauges, **2871**
Roberts, L. C., multichannel two-tone radiotelegraphy, **1212**
Roberts, S., dielectric and piezoelectric properties of $BaTiO_3$, **3547** ; noise measurements on crystal mixers, **2569**
—— and A. von Hippel, dielectric constant and loss measurement at u.h.f., **178**
Roberts, W. A., keying monitors, **1864**
Roberts, W. O., with A. H. Shapley, magnetic disturbances and solar corona, **3117**
Roberts, W. van B., input impedance of folded dipole, **3428**
Robertson, A. J. E., 6-wire transmission-line feeder system, (D) **2688**
Robertson, D. S., and L. C. Nye, RC beat-frequency oscillator, **672**
—— with L. E. V. Lynch, parallel-T networks for RC oscillators, **659**
Robin, L., diffraction of e.m. waves at surface of separation of two media, **2078**, **2079** ; e.m. wave propagation and diffraction in successive media, **1413**
Robinson, A. K., F.C.C. frequency measurement techniques, **3577**
Robinson, C. L., quiet break-in system, **1910**
Robinson, E. L., with others, progress in engineering knowledge in 1946, **2996**
Robinson, K. G., and B. W. Mott, surface hardening of Al and alloys, **2465**
Robinson, R. H., manufacture and insulation of copper wire, **756**
Robinson, W. H., lateral recording, **1993**, **3011**
Rocard, Y., Huyghens' principle, **845** ; self-oscillation mechanisms, **1701** ; U.R.S.I. conference, **2758**
—— with R. Jouty, multiple self-oscillations on wire, **1728**
Rochester, G. D., cloud-chamber investigation of penetrating showers, **1442**
—— C. C. Butler and S. K. Runcorn, meson production in lead, **2415**
Rock, G. D., with others, supersonic waves and conductivity of salt solutions, **1397**
Rockett, F., modulation types and characteristics, **4061**
—— with A. A. McKenzie, applications of sonic and supersonic vibrations, **3973**
Rockwood, C. C., with others, ultraviolet solar spectrum up to 88 km height, **1421**
Rodda, S., triode characteristics, **3357**
Roddam, T., f.m. receiver design, **2365**, **4018** ; noise and pulse modulation, **238** ; supersonics and flight of bats, **4** ; type of modulation for v.h.f. broadcasting, **1948** ; wide-band f.m. for trunk communications, **3652**
Roeschke, C., transformer design, **3038**
Rogers, G. L., RC filters for gramophone amplifiers, **3839**
Rogers, R. R., D. A. Tetu and H. Livingstone, weathering tests on Mg, **1464**
Rogers, T. H., high-intensity X-ray tube, **2532**
Rollin, B. V., nuclear magnetic resonance and spin lattice equilibrium, **708**
Romani, L., with H. Bruck, e.s. lenses, **1544**
Romanowski, M., Introduction au Calcul des Inductances, (B) **683**
—— and R. Hérou, inductance standards, **1129**
—— and G. Leclerc, a.c. Wheatstone bridge, **2854**
—— with R. Hérou, Maxwell-Wien bridge for comparing inductance standards, **793**
Romnes, H. I., with L. G. Abraham, television networks, **3317**
Roorda, J., Jr, RC amplifier analysis, **386**
Roos, W., background noise in amplifiers, **3834**
Roquet, J., isothermal remanence of $Fe_2O_3\alpha$, **3150** ; magnetic properties of Fe_2O_3, **749**
Rose, A., film, television, and the eye, **918**
Rose, A. J., X-ray tube with movable anticathode, **2205**
Rose, C. F. P., transoceanic radio amplifier, **59**
Rose, K., materials and techniques for printed electrical circuits, **3164** ; plastic laminates in engineering, **457** ; plastics primer for engineers, **3558**
Rosen, A., end leakage in cable power-factor measurement, **176**, (A) **795**
Rosenberg, W., thermistors, **3044**
Rosenthal, A. H., theatre television projection equipment, **1247**
Ross, H. A., and P. M. Miller, superheterodyne tracking errors, **3967**
Ross, H. McG., with D. T. R. Dighton, c.r. instrument for camera shutter testing, **3220**
Ross, W., h.f. spaced loop d.f., (A) **2126**, **2780**, (A) **3526** ; site and path errors, (A) **2126**, **2782**, (A) **3528**
—— and E. N. Bramley, lateral deviation at sunrise, **2125**
—— with R. L. Smith-Rose, earth mats for d.f. polarization error reduction, (A) **2126**, **2781**, (A) **3527**
Rossi, B., cosmic-ray mesons, (A) **1432**
—— and R. W. Williams, nuclear disintegrations at 11500 ft, (A) **3882**
—— M. Sands and R. F. Sard, slow meson intensity measurement, **3887**
—— with H. Bridge, cosmic-ray bursts, **2766**
—— with R. W. Williams, air showers at 11500 ft (A), **3882**
Rothschild, K., with L. Reiffel, pulse converter, **3446**
Rothstein, J., poisoning of oxide cathodes by gold, (A) **283**
Rothwell, P., sound rays in atmosphere, **1988**
Roubine, E., helix circuit in travelling-wave valves, **2339**, **2340**, **3036** ; recent theories of the aerial, **2331** ; **2012**, **2332**, **2676**
Roush, R. G., adjustable electronic switch, **3868**
Rowe, G. C. B., with J. F. Rider, Radar—What It Is, (B) **2134**
Rowe, R. G., beam array for frequencies above 28 Mc/s, **1354** ; capacitance-operated relays, **2583** ; gain *vs* element spacing in parasitic arrays, **3427**
Rowlands, R. O., double-derived filter terminations, **47**
Roy, C. S., conformal transformations in orthogonal reference systems, (A) **1124**, **3171**
Rožanskij (Rozhanski), I. D., galvanomagnetic effects in semiconductors, (A) **1828**
Rubenstein, J. H., electronic magnetometer, **1510**
Rudd, J. B., insertion characteristics of filters, **1697** ; transfer impedance of π and T networks, **657**
Rudd, W. C., duplex operation of induction heaters, **829**
Rudnick, I., propagation of acoustic wave along boundary, **3387**
Rufolo, A., and H. K. Graves, dielectric strength of varnished cambric, **760**
Rulison, R., automatic glazing machine, **777**
Runcorn, S. K., with others, meson production in lead, **2415**
Rushman, D. F., and M. A. Strivens, permittivity of titanates, **2806**

—— with others, Curie point of BaTiO$_3$, 3930
Rushton, W. A. H., with D. F. Gibbs, wide-range linear timebase 1711
Russell, B., aircraft radar aerials, 1341
Russell, F. A., with others, analysis of problems in dynamics by electronic circuits, 2827
Russell, O. J., skip distance effect on λ 5 m, 1561, (D) 3632
Rust, N. M., with L. H. Dawson, wide-band linear array aerial, 1353
Ruthberg, S., cold-cathode gas tubes as noise generators, (A) 589
Ryazin, P. A., and L. M. Brekhovskikh, radio waves between two semiconducting surfaces, 2889
Rybner, J., Fourier analysis of sawtooth f.m. oscillations, 784
Rydbeck, O. E. H., ionosphere and solar eclipse of 9th July 1945 in Sweden, 1777
Ryde, J. W., microwave attenuation and scattering in atmosphere, 815
Ryder, E. J., with others, spark gap switches for radar, 899
Ryder, J. D., and W. B. Boast, a.c. network analyser, 362, (D) 3042
Ryle, M., and D. D. Vonberg, 175 Mc/s solar radiation, 89
Ryle, P. J., steel towers for transmission lines, (A) 250
Rytov, S. M., A. M. Prokhorov and M. E. Zhabotinski, frequency stabilization theory, 363

S

Saby, J. S., and W. L. Nyborg, ray computation for non-uniform sound fields, 329
—— with M. P. Givens, parallel-T null network, 3452
Sacerdote, G., acoustic absorption measurement, theory, 340, by phase-shift, 2658
Sack, R. A., frequency dependence of dielectric constant in dipolar solids, 2743
Sage, S. A. J., Al alloy developments, 2470
Sager, I., multiple thyratron circuits, 1031
Saget, J., 1000- and 2000-kV X-ray generators, 1547, (D) 3616
Saha, M. N., m and cm radio waves from sun and stars, 1074 ; r.f. energy from sun, magneto-ionic theory, 404
Saic, F. C., inversion of autodyne principle, 3472
Salinger, H., e.s. image dissector, (A) 1239, 3312
Salpeter, J. L., permanent magnets, 3935
Saltikov, V. S., amateur frequency bands, 2575
Salvini, G., cosmic radiation absorption at 2100 m, 2413
—— with others, penetrating component in cosmic-ray showers, 27[illegible]
Salzberg, B., valve equivalent circuit, (D) 2622, (D) 3721
Samuel, A. L., oscillographic method of presenting impedances, (A) 1026
—— with J. W. Clark, u.s.w. reflex oscillator with wide tuning range, [illegible]
Samulon, H., synchronization of valve generators, 2361
Sandel, B., wide-range receivers for signal generator testing, 858
Sander, K. F., radio noise from sun, 3108
Sanders, F. H., radar development in Canada, 2133
Sanderson, L., infra-red gas burner, 2519
Sands, L. G., f.m. radio equipment on U.S. railways, 2247, 3664
Sands, M., with others, slow mesons, intensity measurement, 3887
van Santen, J. H., and G. H. Jonker, permittivity of BaTiO$_3$, 2459
Saraga, W., insertion loss and insertion phase shift of multi-section Zobel filters, 2696
Šaravskij, P. V., solid rectifiers, (A) 1828
Sarbacher, R. I., and W. A. Edson, Hyper and Ultrahigh Frequency Engineering, (B) 1300
Sard, R. D., shot noise from multiplier tube, 1628
Sard, R. F., with others, slow mesons, intensity measurement, 3887
Sargrove, J. A., barrier-layer photocell, 3332 ; insulating plates in receiver production, 1913, (A) 2555
Sarna, H. R., and O. P. Sharma, cosmic radiation, abnormal increase July–Aug. 1946, 401
Satche, P., constants of passive network, 3821
Sauer, H. A., high-speed life test for capacitor paper, 1498
Saulnier, A., absorption of secondary electrons by thin screens, 1742
—— and J. J. Trillat, radiography by secondary emission, 1549
Saunders, F. A., analysis of tones of wind instruments, 332
Saxton, H. L., with R. J. Urick, surface reflection of short supersonic pulses in the sea, (A) 2307
Saxton, J. A., and L. H. Ford, dipole reflector insulation, 357
Scaff, J. H., and R. S. Ohl, development of Si crystal rectifiers, 4085
Scandone, F., and L. Ballerini, optical properties of thin metallic laminae, 692
Scarff, O. P., tropicalization for transformers and chokes, 133, (D) 134
Schade, O. H., with R. S. Mautner, television h.v. r.f. supplies, 3674
Schallamach, A., dielectric relaxation of liquid mixtures, 2742
van der Scheer, J. W. A., with H. Wachter, oil diffusion pump tests, 1597
Schein, M., origin of cosmic-ray mesons, (A) 1433
—— P. S. Gill and V. Yngve, mesons, latitude effect up to 35000 ft, (A) 3882
Schelkunoff, S. A., cylindrical aerials, (D) 2333 ; generalized boundary condition in e.m. problems, (A) 1059, 3094
Schendel, H. W., magnetic design factors of radio components, 365
Schérer, M., safety device for vacuum plant, 1103
Scherrer, P., with G. Fejér, waveguide measurement of dielectric constants, 2486
—— with B. Zwicker, electro-optical properties of KH$_2$PO$_4$ and KD$_2$PO$_4$, 2450
Scheuch, D. R., and F. P. Cowan, pulse generator with variable time delay, 256
Schiess, W., C.C.I.F., Montreux, Oct. 1946, 3373 ; 3-cm naval radar demonstration, 1096
Schiff, L. I., with others, sound field plotter, 3389 ; thermal ionization of impurity levels in semiconductors, 2453
Schilling, H. K., and others, supersonic propagation in open air, 1989
Schlechten, A. W., with W. J. Kroll, Ti and Zr, 147
Schlesinger, K., with others, single carrier television, (D) 2263
Schmidt, A., Jr, nonlinear commutating reactors for rectifiers, 360
Schmidt, F. H., mechanical f.m. applied to cyclotron, 213
—— with K. R. MacKenzie, f.m. for cyclotron, (A) 1162
Schmidt, K. O., optimum ratio of coaxial cable conductor diameters, 1664
Schmitt, O., aircraft aerial patterns, (A) 1004, (A) 3031
Schmitt, O. H., and W. P. Peyser, aircraft aerial pattern plotter, 2684
Schneider, W. C., with others, dielectric properties of rubbers, 2815
Schoenfeld, R., W. Brown and W. Milwitt, synchronizing-signal generators, 3489
Schoerer, L., magnetic amplifiers, 1042
Schonland, B. F. J., and P. G. Gane, lightning warning device, 3987
Schorr, M. G., with H. Lamport, paper screen for ballistics measurement, 489
Schorr, N. A., radar on the Great Lakes, 2432
Schott, L., with R. R. Riesz, c.r. tube for visible speech, (A) 3398
Schoute-Vanneck, C. A., with R. W. Guelke, measurement of sea-water velocity by induction, 3602
Schouten, J. A., with H. B. Dorgelo, units and dimensions, 1392, 2383
Schramm, C. W., with others, high Q resonant cavities for microwave testing, 378
Schreiner, K. E., high-performance demodulators for servo-mechanisms, (A) 1224, 3290
Schremp, E. J., with R. Q. Twiss, equivalent circuit for amplifier valve noise, (A) 37
Schrödinger, E., Statistical Thermodynamics, (B) 1071
Schroeder, A. C., with G. C. Sziklai, cathode-coupled triode amplifiers, (D) 2046 ; electronic spectroscopy, 1535
—— with others, television in colour, 2958, by single carrier, (D) 2263
Schroeder, C. A., with others, diode coincidence circuit, (A) 3989
Schroter, R., superconductivity, 3087
Schulman, J. H., luminescence of Mn-activated phosphors, 1808
Schultz, H. L., counter for random or uniformly spaced pulses, 3807
—— and others, cavity accelerator for electrons, 3999
Schultz, L. N., broadcasting studio equipment, 2939
Schultz, N. R., with N. H. Meyers, a.c. network analyser, 31
Schüpbach (Schuepbach), R., dm directional equipment, 1936, unitized, 1937 ; dm waves in communications and remote control, 1939
Schutz, G. C., with E. A. Blasi, test equipment and technique for airborne-radar field maintenance, 2498
Schwabe, E., recording of current and voltage fluctuation, 792
Schwartz, L. S., pulse wave-front steepness in timing circuits, 1032 ; specification of receiver sensitivity and transmitter output at u.h.f., 193
Schweizer, R., 50-W dm-wave transmitter, 1621
Schwinger, J., electron radiation in high-energy accelerators, (A) 1538
Scolnik, R., and others, electrical characteristics of quartz crystal units, 3574
Scott, H. H., noise suppression in gramophone records, 991 ; reduction of background noise in musical record reproduction, (A) 985, 3006
Scott, J. M. C., theoretical field strength estimation for u.s.w. propagation, 510
Scott, R. A., with A. F. Gunn, measurement of thickness of thin films, 967
Scott, R. F., 250–300 Mc/s radiophone, 2604
Scott, W. E., American magnetic data for 1946, 3116 ; geomagnetic activity indices, July–Sept. 1946, 1770 ; international quiet and disturbed days, Jan.–Mar. 1946, 1769, April–June 1946, 3115, July–Dec. 1946, 3895 ; mean K-indices for 1945, 3114
Scroggie, M. G., navigational aids for civil aviation, survey, 426 ; post-war marine radar in Great Britain, 3136 ; radio and radar training in R.A.F., 319
Sear, A. W., wire recorder wow, 1987
Sear, R., with F. Jones, cable impedance measurement at u.h.f., 175
Sears, F. W., Principles of Physics: Electricity and Magnetism, (B) 82
Seaton, S. L., temperature of upper atmosphere, 3123
Secor, H. W., and E. Leslie, anti-collision radio, 427
Seeley, S. W., and J. Avins, ratio detector, 3643
Selby, M. C., and others, electrical characteristics of quartz crystal units, 3574
Selby, R., microphone preamplifier, 3457
Selgin, P. J., Electrical Transmission in Steady State, (B) 2054
Selme, P., interruption of electron beams, 2020 ; mechanism of photographic action of electrons, 2070
Sels, H. K., sign of reactive power, (D) 1972
Selvidge, H., guided missiles, 1171
Selzer, É., background noise and a.f. oscillations in magnetrons, 1643 ; construction and static properties of simple magnetrons, 1644
Semenova, O. P., mechanism of arc discharge, 2396
Sena, L., ion motion in electric field in gas, 1405, 2064
Sengupta, M. M., and S. K. Dutt, Chapman's formula for E-layer ionization, 3903
Serber, R., with others, cyclotron, University of California, 3234
Sewell, B. C., perfect *vs* pleasing reproduction, (D) 2554
Sewell, D. C., with others, cyclotron, University of California, 3234
Seyler, P. K., and others, R/T for rural communities, 3659
Shackelton, W. J., prospecting by airborne magnetometer, 3245
Shanklin, J. P., v.h.f. train communications in tunnels, 3663
Shapley, A. H., and W. O. Roberts, magnetic disturbances and solar corona, 3117
—— with H. W. Wells, eclipse effects in F$_2$ layer of ionosphere, [illegible]
Sharavski, P. V. See Šaravskij, P. V.
Sharma, O. P., with H. R. Sarna, cosmic radiation, abnormal increase July–Aug. 1946, 401
Sharpe, J., ion trap in c.r. tubes, 1268
Sharpless, W. M., angle of arrival of microwaves, 1182
—— with A. B. Crawford, angle of arrival of microwaves, 1183, (A) 4009
Shatford, P. A., with others, triode amplification factors, 2621
Shaw, R. C., and R. J. Kircher, water load for power measurement, 2172
Shchegolev, E. Ya., radio technique for long-range navigation, 3910
Shchukin, A. N., effect of sudden e.m.f. in amplifiers, 3475 ; preventing impulse interference, 3648
Shea, G., electronic aids for aircraft, 1455
Shea, H. G., colour television for theatres, 3314 ; P.I.C.A.O. instrument landing specifications, 2436
Shelby, R. E., F. J. Somers and L. R. Moffett, naval airborne television reconnaissance system, 2960
Shelton, E. E., with A. M. Spooner, line scanning systems for television, 271
Shelton, G. R., with others, Ba-Sr titanate dielectrics, 3551
Shenk, J. H., and others, plastic optical and infra-red filters, 3541
Shepherd, W. G., with J. O. McNalley, reflex oscillators for radar systems, (A) 1026, 3057
Sheppard, P. A., British radiosonde, (D) 1773
Sherbin, L. E., waveguide data as function of frequency and dimensions, 1319
Sheren, B., production testing of high power tubes, (A) 1258, 3334
Shifflett, P. R., with others, telemetering from V-2 rockets, 2536, 3242
Shipman, J. D., Jr, B. Howland and C. A. Schroeder, diode coincidence circuit, (A) 3989
—— with G. J. Perlow, non-primary cosmic-ray electrons above earth's atmosphere, 2762
Shmushkevich. See Šmuškevič
Shockley, W., with G. L. Pearson, Hall effect and resistivity of Ge and Si from 10° to 600°K, (A) 2452
Shorey, L. F., and S. M. Gray, interference by fluorescent lamps, (A) 2231, 2571
Shorter, D. E. L., loudspeaker transient response, 1313
Shotter, G. F., and H. D. Hawkes, ac./d.c. power and voltage comparator, 183, (A) 803
Shpuntov, A. I., with I. I. Volman, vibrator in rectangular waveguide, 3789
Shuart, G. W., narrow-band f.m. with crystal control, 932
Shulman, A. R. See Šulman, A.R.
Shulman, C. I., with L. P. Smith, frequency modulation and control by electron beams, 3699
—— with others, 25-W f.m. magnetron for 4000 Mc/s, 3730
Shur, Ya. S., and A. S. Khokhlov, magnetostriction of transformer steel, 3945
Siegbahn, K., G-M counter characteristics in Neher-Harper circuit, 1871
—— with N. Svartholm, magnetic field for electron focusing and β-spectroscopy, 1868
Siegert, A. F. J., with M. Kac, receiver noise theory, (A) 1199
Siegert, A. J. F., probability density of random function, (A) 1127
—— with M. Kac, noise in receivers with square-law detectors, 3645
Sillars, R. W., with others, SiC non-ohmic resistors, 141, (D) 1115
Silsbee, F. B., change of electrical units, (A) 3956 ; sign of reactive power, (D) 1289
Silva, G., plotting e.s. fields, 446
Simmonds, J. C., with others, power loss in e.m. screens, 88
Simon, A. W., coil winding formulae, 2720 ; inductance of universal-wound coils, 367
Simpson, I. F., design of communications receivers, 861
Simpson, J. A., Jr, l.v. counters, (A) 3980
Simpson, K. M., with others, cyclotron, University of California, 3234
Simpson, O., with others, PbS photocells, 3709
Sinclair, G., miniature aerials, use for aerial design, (A) 2011
Singer, C. H., preventive maintenance for broadcast systems, 541
Singer, G., C. B. Braestrup and H. O. Wyckoff, X-ray absorption measurements, 336
Singer, K., with M. Rettinger, frequency response of film soundtrack, 995
Skellett, A. M., beam production in l.v. tubes, 1629 ; electron resonator, Palletron, (A) 3996
Skobel'tsyn, D. V., atmospheric showers and bursts, 1439 ; cosmic rays, Pamir expedition, 2112
—— G. T. Zatsepin and V. V. Miller, lateral extension of Auger showers, 2765
Skroder, C. E., and M. S. Helm, Circuit Analysis by Laboratory Methods, (B) 1054
Slack, C. M., and D. C. Dickson, Jr, microsecond radiography, 3240
Slater, F., perfect *vs* pleasing reproduction, (D) 2554
Slater, J. C., microwave electronics, 2668
Slaymaker, F. H., W. F. Meeker and L. L. Merrill, directional characteristics of disk in baffle or horn, 328
Sleeper, H. P., Jr, with others, noise reduction in aircraft, 3405
Sloane, F., magnetostriction in industrial processes, 127
van Slooten, J., geometrical considerations in 4-terminal networks, 2032
Smith, A. W., and D. K. Weimer, magnetostriction gauge for supersonic intensities, 3580
Smith, C. E., Directional Antennas, (B) 3438
Smith, C. H., with R. A. Smith, crossed-dipole d.f. systems, 1347
Smith, C. S., Jr, and R. L. Barrett, chemical identification by X-ray diffraction, 2884
—— with others, B-H meter for small cross-sections, 1853
Smith, D. B., and W. E. Bradley, impulse noise in f.m. receivers, 857
Smith, D. S., telephone magneto design, 550
Smith, E. K., with D. V. Edwards, circuit cushioning of gas-filled rectifiers, 381, (D) 3040
Smith, F. A. B., with A. F. Hopkins, Jr, radio controlled buoys, 1454
Smith, F. W., Jr, and M. C. Thienpont, electronic attenuators, 3485
Smith, J. H., proton range-energy values, 1736
Smith, J. W., and N. H. Hale, speech clipping, and filtering, 333, for increased intelligibility, 336
—— with others, s.w.r. meter for coaxial lines, 3196
Smith, L. P., and C. I. Shulman, frequency modulation and control by electron beams, 3699
—— J. Kurshan and J. S. Donal, magnetron modulation, (A) 3698
Smith, Newbern, U.R.S.I., Paris, 1946, 3376
Smith, P., anodizing, 143
Smith, P. H., f.m. broadcast aerial design, (A) 3027
Smith, P. I., Plastics for Production, (B) 2824
Smith, R. A., radar development, 3144
—— and C. H. Smith, crossed-dipole d.f. systems, 1347
Smith, R. H., with S. J. Haefner, standard frequency generator, 2858
Smith, R. M., medium-power bandswitching transmitter, 276 ; stabilized amplifier using 813 beam tetrode, 1713
Smith, R. N., with others, Purdue microwave electron accelerator, (A) 1540
Smith, R. W. K., with D. H. Ewing, teleran, (A) 1089, 3138, 3139
Smith, W. W., speech clipping, 1981
Smith-Rose, R. L., cm λ propagation over land and sea, 517 ; I.E.E. Radio Convention, March–April 1947, 2647
—— and W. Ross, earth mats for d.f. polarization error reduction, (A) 2128, 2781, (A) 3527
Smitley, C. R., and R. E. Graber, electronic switch for pulse production, 3047
Šmuškevič, I. M., with B. I. Davydov, electrical conductivity of semiconductors in strong electric fields, 1818
Smyth, C. P., molecular freedom in solid dielectrics, 2740
—— with others, dielectric properties of rubbers, 2815
Smyth, J. B., and L. G. Trolese, reflection of radio waves from troposphere, (A) 1180
Snoek, J. L., after-effects in ferromagnetic materials, 1823 ; non-metallic magnetic material for h.f., 3155
—— with G. N. Rathenau, apparatus for measuring magnetic moments, 166
Snyder, C. J., with L. F. Hickernell, Pb alloy for cable sheathing, (D) 28[illegible]
Snyder, H. S., fluctuations for proportional counters, (A) 3979
Sokolow, A., polarization of electron waves, 2385
Somers, F. J., with others, naval airborne television reconnaissance system, 2960
Somerville, J. M., with others, magnetically-controlled gas discharge tubes, 591
Sominskij, M. S., with others, thermoelectric effect in PbS, 1821
Sommer, A., Photoelectric Cells, (B) 3358
Sondheimer, E. H., demagnetization coefficients and hysteresis losses of Fe-Si strips, 2804
Sonkin, S., crown-of-thorns tuning of magnetrons, (A) 289
Sontheimer, C., with M. C. Jones, micromatch for measurement of s.w.r. and r.f. power, 2853, 3188
Sorokina, V. V., cold-cathode kenotrons, 581
Sosnowski, L., J. Starkiewicz and O. Simpson, PbS photocells, 3709
Soule, R. G., Jr, installation of 3-kW f.m. broadcast transmitter, 3694
Southey, R. V., sound recording and reproduction, 1657
Southwell, R. V., Relaxation Methods in Theoretical Physics, (B) 469
Spangenberg, K., with others, cathode design for electron-beam tubes, 4071 ; electron-beam dispersion at high vacuum, [illegible]
Spangenberg, K. R., triple-resonant band-pass filters, 46
Sparks, W. A., crystal- and v.f.o.- frequency mixing circuit, 1764
Spaulding, F. E., Jr, radar for merchant marine, 3531
Spear, C., transmission lines for f.m. and television receivers, 2330
Spencer, D. E., with P. Moon, international suffixes in scientific nomenclature, 597
Spencer, R. C., optical theory of corner reflector, (A) 2389
Spilhaus, A. F., recent meteorological equipment, 3119
Spilsbury, R. S. J., and A. Felton, millisecond chronoscope, (A) 1137, (A) 3984
Spitzer, L., Jr, galactic magnetic field, 1422
Spiwak, G., and J. Kardash, imprinting of images by lightning, 1460
Sponable, E. I., historical development of sound films, 3412
Spooner, A. M., and E. E. Shelton, line scanning systems for television, 271
Sproull, R. L., excess noise in cavity magnetrons, 3268
—— with E. G. Linder, maximum efficiency of reflex klystron oscillators, (A) 588, 2993
Squier, R. T., c.r. compass, 3206
Stager, H., and F. Held, softening of polyvinyl chloride, 1488
—— B. Frischmuth and F. Held, dielectric and mechanical properties of organic layered insulating materials, 1474
Stagg, J. M., meeting of International Union of Geodesy and Geophysics, 2297
Stahl, H., and S. Wagener, production of thin metallic films by vaporization, 1414
Staines, C. R., medium power s.w. telephone-telegraph, 1252
Stair, R., and C. A. Faick, infra-red absorption spectra, 3540
Stamford, N. C., and R. B. Quarmby, characteristics of r.f. cables, 174
Stanley, V. A., with E. W. Bull, e.s. *vs* e.m. deflection in c.r. tubes, (AD) 304
Stannard, G., with F. J. Stringer, compensation of temperature effects in broadcasting music circuits, 3419
Stanworth, J. E., with A. E. Dale, sealing glasses, 1467
—— with G. D. Redston, glass-to-metal seals, 1465
Starkiewicz, J., with others, PbS photocells, 3709
Starnecki, B. J., factors influencing microwave propagation, (A) 512
Staub, H. H., with others, neutron polarization and ferromagnetic saturation, 2076
Stedman, G., nature of rotation, 2727
Steen, J. R., quality control of valves, 1963
van Steenkiste, R., electronic relays, 3988
Steinberg, J. C., and N. R. French, portrayal of visible speech, (A) 3396
—— with N. R. French, factors governing speech intelligibility, 1979
Steinberg, J. L., and J. Denisse, galactic and solar r.f. noise, survey, 1575
—— with J. Denisse, h.f. energy of ionized gas in magnetic field, 2406
Steiner, F., applications of Riemann's number sphere to circuit theory, 1361
Steiner, H. C., with C. C. Herskind, working characteristics of ignitrons, 574
Stephenson, H. G., Jr, 1-kW studio transmitter building, 2944
Sterling, H. T., simple Wien-bridge audio-oscillator, 8
Stetson, H. T., sunspots and E layer density, 1077 ; sunspot cycles and long distance propagation, 1429
—— with G. W. Pickard, tropospheric reception, (A) 3634
Stevens, C. M., with others, mass spectrometer for leak detection, 2441

Stevens, S. S., J. Miller and I. Truscott, masking of speech by standard waveforms, **837**
—— with others, premodulation clipping for speech intelligibility, **1980**
Steward, W. E., Electrician's Maintenance Manual, **(B) 1299**
Stewart, C., automatic voltage control of generators, **(A) 4039**
Stewart, G. S., with J. S. Hey, determination of meteor stream radiants by radio observation, **2086**
Stieltjes, F. H., frequency-transposition systems, using Campbell's theory, **1368**
Stigant, S. A., impedance tensors for closed mesh networks, **2033, 3820**
Stoffregen, W., Swedish ionosphere eclipse records 9th July 1945, **1778**
—— with H. Norinder, nature and variation of atmospherics, **1784**
Stokes, A. P. D., with others, cm-λ attenuation in rain, **(A) 1181, 2553**
Stokes, V. O., phase modulation, **1254**
Stokley, J., electron and ion accelerators, **3608**
—— with others, progress in engineering knowledge in 1946, **2996**
Stolze, W. J., receiver input circuit noise calculations, **2228**
Stone, H. A., Jr, nonlinear coils for pulse generators, **1051**
Stone, R. P., with others, pulse triodes for 1 MW at 600 Mc/s, **2982**
Stone, W. M., solution of linear difference equations, **3476**
Störmer, C., auroral height distribution in S. Norway, **1785**
Stout, J. W., superconductivity, magnetic quenching, **3088**
Stoyko, N., magnetic fluctuations and velocity of short radio waves, **3251**
Straede, J. W., response equalization, **3774**
Strafford, F. R. W., transmission lines for television receivers, **633**
Strain, C. V., with others, ultraviolet solar spectrum up to 88 km height, **1421**
Strandberg, M. W. P., and others, inversion spectrum of NH_3, **3096**
—— with others, microwave absorption of carbonyl sulphide, **(A) 3872**
Stringer, F. J., and G. Stannard, compensation of temperature effects in broadcasting music circuits, **3419**
Strivens, M. A., with D. F. Rushman, permittivity of titanates, **2806**
Struthers, F. W., and H. M. Trent, ultrasonic measurement of cylinder wall thickness, **3594**
Strutt, M. J. O., gain and sensitivity of amplifier and frequency-changer stages, **3067**; noise reduction in mixer stages, **1573, (C) 2918**
Struyk, C., and A. E. Carlson, Cu plating, **448**
Stuart, L. E., i.f.f. identification system, **1456**
Stubbings, G. W., definitions of Ohm's law, **1063**; Elementary Vectors for Electrical Engineers, **(B) 1128**
Stumpers, F. L. H. M., frequency spectrum of modulated oscillations, **(A) 2221**
Sturley, K. R., f.m., **(D) 2237**
Sturtevant, J. M., audio amplifier, **3484**
Stuzzi, V., Single-Span receiver, λ 200–2000 m, **1917**
Styles, H. E., design of tuned a.f. filters, **3486, 3840**
Suart, R., modern transmitting valves, **2616**
Sucksdorff, E., diurnal variations of computed currents in the high atmosphere, **3906**
Sueur, R., C.C.I.F. at Montreux, **4095**
Suits, C. G., physics and engineering, **3363**
Suker, J. H., dielectric heating, survey of principles and methods, **(A) 1880**
Šulman, A. R., conductivity of semiconductors, and of alundum, **(A) 1828**
Sumner, W. L., Progress in Science, **(B) 1297**
Suquet, P., quantum theory of e.m. fields, **2384**
Surdin, M., directive couplers in waveguides, **1359, (A) 1684**
Sutherland, G. B. B. M., with F. J. Cripwell, absorption of cm waves by liquid dielectrics, **2840**
—— with E. F. Daly, infra-red spectroscope with c.r. presentation, **2860**
Sutro, P. J., mode separation in coaxial oscillator, **1332**
Svartholm, N., and K. Siegbahn, magnetic field for electron focusing and β-spectroscopy, **1868**
Swallow, J. C., insulating materials in radio engineering, **(AD) 2144**
Swann, W. F. G., piezoelectric oscillations, theory, **381**
Sweet, M. H., logarithmic photometer, **830**
Synek, E., acoustic problems of electrodynamic loudspeakers, **1310**
Sziklai, G. C., and A. C. Schroeder, cathode-coupled triode amplifiers, **(D) 2046**; electronic spectroscopy, **1535**
—— with R. D. Kell, miniature airborne television equipment, [illegible]
Szpor, S., selective attraction of lightning, **896**

T

Tabard, R., expansion circuits, **2565**; line-of-sight aerials, **1339**
Taft, E., with others, crystal networks, **(A) 3450**
Tagliaferri, G., with others, penetrating component in cosmic-ray showers, **2764**
Tamm, I., and S. Belenky, energy spectrum of cascade electrons, [illegible]
Tapp, C. E., application of superregeneration to f.m. receivers, **4017**
Tappenden, F., with N. Phelp, timer for photo-printing, **200**
Tarbès, P., improvements in MacLeod gauge, **1101**
Tarbouriech, M., dimensional equations of electric and magnetic quantities, **696**
Tartakovsky, P. S., and G. I. Rekalova, inner photoelectric effect in sulphur and electronic energy levels, **(A) 1828**
Tarzian, S., A. Valdettaro and M. Weigel, a.m. broadcasting for small communities, **(A) 2245**
Tatel, H. E., with others, cosmic rays, methods of V-2 rocket experiments, **(A) 3882**
Taylor, A. H., pentagrid applications, **1053**
Taylor, D., and W. H. Penley, scanning equipment for ground radar, **738**
—— and C. H. Westcott, divided broadside aerials for 200 Mc/s, [illegible]
Taylor, F., Cd electroplating, humidity tests, **779, 1485, 2157**
Tcheng, Mao-Lin, with others, solar activity and luminescence in earth's upper atmosphere, **3105**
Tchernikova, L., with N. Poptzov, properties of polycrystalline ferromagnetic substances, **2075**
Teal, G. K., J. R. Fisher and A. W. Treptow, photocell using photoconductive Si, **1961, (A) 4064**
Teeter, C. E., Jr, supersonic radar trainers, **(A) 2307**
Teleshevski, S. E., electronics, **3993**
Tellegen, B. D. H., four-terminal network synthesis, **42**
Terada, K., terrestrial diurnal magnetic variation, **3896**
Terlecki, R., and J. W. Whitehead, capacitance abac for use with avometer Type D, **805**; receiver operation on 28V, **3261**
Terletzky, J., induction of fast charged-particle currents by rotating magnetized cosmic bodies, **1750**
Terman, F. E., and J. M. Pettit, compensated-loop direction-finder, **(C) 2431**
Tesmer, S., spark discharge mechanism, **1060**; voltage recovery in v.h.f. sparks, **700**
Tetelbaum, S., broadside aerial arrays, **1351**; efficiency of radio for power transmission, **3623**; radiolocation, basic equations, **3913**
Teeu, D. A., with others, weathering tests on Mg, **1464**
Thacker, G. O., and R. Y. Walker, magic-eye tuning indicators, **1255**
Thellier, E., thermo-remanence and metamagnetism, [illegible]
—— and O. Thellier, earth's magnetic field in ancient France, **724**
Thellier, O., with E. Thellier, earth's magnetic field in ancient France, **724**
Thévenin, P., autotransformer theory, **1362**; decimal attenuators, **1388**
Thielsch, H., shadow-cast replicas in electron microscopy, **2201**
Thienchi, Nguyen. See Nguyen, Thien-Chi
Thienpont, M. C., with F. W. Smith, Jr, electronic attenuators, **3485**
Thilo, H. G., receiver for carrier-frequency wired-wireless measurements, **1135**
Thomas, E. L., stroboscopic speed measurement, **1170**
Thomas, Harold A., electrometer input circuits, **1049**
Thomas, Horace A., electronics in industry, **(AD) 1531, (A) 1881, (A) 2523, 3992**
Thomas, H. P., with F. M. Bailey, phasitron f.m. transmitter, **277**
Thomas, J. E., Jr, with others, electron beam displacement in synchrotron, **832**
Thomas, L. H., 150-W push-pull amplifier, **1716**
Thomas, T. S. E., effective impedance of sphere in magnetic field, **366**
Thompson, H. W., with D. H. Whiffen, absorption of microwaves by liquids, **2842**
Thompson, L., embossed groove sound recording, **3414**
Thompson, L. E., microwave relay system, **1578**
Thompson, W. G., electronics in heavy engineering, **492**
Thomson, W. E., transient response, of filters, **(D) 2035**, of video frequency couplings, **671**
Thonemann, P. C., and R. B. King, h.f. energy from ionized gas, **715**
—— with others, magnetically-controlled gas discharge tubes, **591**
Thornton, R. L., with others, cyclotron, University of California, **3234**
Thorpe, H. A., with others, supersonic propagation in open air, **1989**
Thurnauer, H., low-loss ceramic dielectric, **2460**
Tibbs, C. E., wide-band f.m. technique, **235**
Tiberio, U., Introduzione alla Radiotelemetria, **(B) 114**
Tilton, E. P., transatlantic reception on 50 Mc/s, **1560**; transmitter for λ 2 m, **3695**; 6- and 10-m aerial arrays, **1675**
Timofeev, P. V., surface charges in electronic apparatus, **580**
Tinkham, R. J., and J. S. Boyers, magnetic sound recorder, **1995**
Tisza, L., with others, ceramics with high dielectric constant, **759**
Todd, J., with A. Erdélyi, advanced practical mathematics, **1490**
du Toit, S. J., with P. J. G. de Vos, production of penetrating particles by cosmic radiation, **95**
—— with others, G-M counter, **1145**
Tomashov, N. D., anodizing, **143**
Tomer, R. B., 2-m communication receiver construction, **4016**
Tomes, G. A. R., and M. V. Brian, electronic tracking of beetles, [illegible]
Tomlin, G. M., with H. C. Turner, electrical engineer in other industries, **2879**
Tomlin, S. G., with P. J. Wallis, current and power in v.m. valves, **(D) 2272**
Tomlinson, F. W., and H. M. Wright, mineral-insulated metal-sheathed conductors, **12, (A) 629, (D) 2323**
Tongiorgi, V., with G. Cocconi, mean life of meson, **2104**; zenithal variation of cosmic radiation, **2103**
—— with others, cosmic-ray showers, density spectrum, **2108, 2109**, penetrating particles, **2110**
Tool, A. Q., viscosity and heat effects in glass, **776**
Toth, E., high-fidelity reproduction of music, **3407**; noise and output limiters, **867, 1202**; soldering stranded wire, **2466**
—— with T. McL. Davis, naval communications receiver design for v.h.f. and u.h.f., **2222**
Toulis, W., with others, excitation of high-Q cavity, **(A) 1033**
Toulon, P., pre-television, **909**; quality control of dielectrics using h.f. currents, **179**
Tournery, F., attenuator resistor construction, **1390**
Tourney, P. L., with others, studio and speech-input equipment, **350**
Tousey, R., with others, ultraviolet solar spectrum up to 88 km height, **1421**
Towlson, H. G., protecting against carrier failure, **879**
Town, G. R., progress in television in U.S.A., **4055**
Townes, C. H., NH_3 spectrum near λ 1.25 cm, **1399**; radio radiation from the Milky Way, **3511**
—— and F. R. Merritt, microwave spectrum of H_2O and D_2O, **693**
—— A. N. Holden and F. R. Merritt, rotational spectra of linear molecules at λ 1 cm, **1732**
Trainer M. A., and W. J. Poch, television equipment for aircraft, **3309**
Traver, H. R., and F. L. Burroughs, microwave spectrum analysers, **2855**
Travis, E., direct-coupled r.f. amplifier, **1043**
Treharne, R. W., J. A. Kammerer and R. Hofstadter, rate-of-change meter, **2870**
Trent, H. M., with R. G. Nuckolls, ultrasonic leak detection in hydraulic systems, **3603**
—— with F. W. Struthers, ultrasonic measurement of cylinder wall thickness, **3594**
Treptow, A. W., with others, photocell using photoconductive Si, **1961, (A) 4064**
Trevor, B., O.E. Dow and W. D. Houghton, pulse time division radio relay, **3281**
Trice, P. V., and M. Barat, Jr, superregenerative frequency converter, **2563**
Trillat, J. J., electrolytic polishing, **2873**; h.v. measurement by electron diffraction, a.c., **2169**, d.c., **791**
—— and C. Legrand, radiographic detection of thin organic layers on steel, **2533**
—— with A. Saulnier, radiography by secondary emission, **1549**
Tripp, W. A., e.m. forces, **1066**
Trolese, L. G., with J. B. Smyth, reflection of radio waves from troposphere, **(A) 1180**
Trump, J. G., e.s. h.v. generators, **4044**
—— and R. J. Van de Graaff, h.v. insulation in vacuum, **3090**
Truscott, I., with others, masking of speech by standard waveforms, [illegible]
Tscherning, H., supersonic generators and applications, **3757**
Tsipkin, Ya.Z., klystron theory, **4081**
Tsvetkov, V. N., relaxation phenomena in anisotropic liquids in rotating electrical field, **1068**
Tucker, D. G., distortion due to interference in pulse systems, **230, (A) 1198**; nonlinear regenerative circuits, **3052**; oscillator response to external e.m.f., **382**; performance criteria for pulse and television amplifiers, **3062**; synchrodyne receiver, **2364, (D) 3638**; transient response of tuned circuit, **1029**; transmission-measuring equipment for communication circuits, **3181, (A) 3962**
Tucker, M. J., with others, frequency analysis of ocean waves, **203**
Tugman, J. L., with others, progress in engineering knowledge in 1946, **2996**
Tumerman, L. A., extinguishing of luminescence, **1809**
Tuominen, J., movements and origin of sunspots, **1419**
Turnbull, C., definitions of Ohm's law, **(D) 2393**
Turnbull, H. W., Mathematical Discoveries of Newton, **(B) 984**
Turner, D. A., with H. C. Wassell, effects of degaussing on ships' magnetic compasses, **844**
Turner, H. C., and G. M. Tomlin, electrical engineer in other industries, **2879**
Turner, R. P., transmitter with efficient bandswitching, **3324**
Turner, W. E. S., technical developments in glass, **450**
Turney, A., interference from r.f. heating equipment, **4020**
Turney, T. H., Electric Filters, **(B) 2382**; Heaviside's Operational Calculus Made Easy, **(B) 2831**
Tustin, A., nature of servomechanism operator's response, **(A) 4039**
Tuttle, W., with others, counting-rate meter, **1150**
van der Tuuk, J. H., h.v. rectifier valves for X-ray diagnostics, **3708**
Twiss, R. Q., and E. J. Schremp, equivalent circuit for amplifier valve noise, **(A) 87**
Tyrrell, A. J., permanent magnet design and application, **2147**

U

Ubbelohde, A. R., and I. Woodward, structure and thermal properties of crystals, **1748**
Underhill, B. B., f.m. mechanical modulator, **889**
Underhill, C. H., 32-Mc/s mobile radio tests, **1590**
United Insulator Co., hermetic seals and bushes, **1944**
Urbach, F., D. Pearlman and H. Hemmendinger, infra-red sensitive phosphors, **121**
Urick, R. J., and H. L. Saxton, surface reflection of short supersonic pulses in the sea, **(A) 2307**
Ursell, F., with others, frequency analysis of ocean waves, **203**

V

Vadersen, C. W., cathode phase inverter design, **3815**
Vasino, F., television system on single carrier wave, **1699**
Vaile, R. B., Jr, recent developments in magnetic recording, **(A) 985, 3014**
Valdettaro, A., with others, a.m. broadcasting for small communities, **(A) 2245**
Vale, K. R., h.v. vacuum-sealed relay, **898**
Vallarta, M. S., M. L. Perusquia and J. De Oyarzabal, cosmic radiation, energy spectrum, **(A) 1434**
Vallese, L., pulse voltages, **2698**
Van Allen, J. A., with others, cosmic rays, methods of V-2 rocket experiments, **(A) 3882**
Vance, A. W., with others, Electron Optics and the Electron Microscope, **(B) 1174**
Vand, V., with V. Křížek, German infra-red technique, **210**
Van de Graaff, R. J., with W. W. Buechner, radiation losses of β-rays, **77**
—— with J. G. Trump, h.v. insulation in vacuum, **3090**
Vanderlippe, R. A., airborne teletype printer, **873, 2252**
Van Dyke, K. S., with C. P. Glover, variations in crystal quartz, **(A) 3926**
Vane, A. B., with others, atmospheric microwave absorption measurements, **1843**
Van Inwagen, C. L., SJ radar for submarines, **737**
Van Vleck, J. H., microwave absorption, by oxygen, **3098**, by water vapour, **3100**
—— and D. Middleton, visual, oral, and recorded reception of pulses, **1919**
—— F. Bloch and M. Hamermesh, theory of radar reflection from wires, **3035**
Varela, A. A., effect of d.c. potential on initiation of r.f. discharge, **2397**
Vargin, V. V., and T. I. Weinberg, luminescence of glasses, survey, [illegible]
Varley, W. E. C., B.B.C. transmitter synchronization improvements, **3697**
Varma, R. S., generalization of Laplace transform, **2478**
Varshney, Y. P., central glass and ceramic research institute, India, **3360**
Vassy, É., with others, altitude of emission of night sky light, **2119**
Vassy, Mme É., with others, altitude of emission of night sky light, [illegible]
Vaughan, J. F. O., remote control for receiver, **4040**
Vaughan, J. T., and J. W. Williamson, design of induction heating coils for cylindrical magnetic loads, **2676**
Veksler. See Wechsler
Vergennes, J., colour television, **911**
Vermeir, G. R. O., with G. F. Craven, cancellation of even-harmonic distortion in push-pull operation, **2719**
Verschuur, J. J., natural frequencies of resonant cavities, **379**
Versnel, A., with A. van der Ziel, total emission noise in diodes, **3343**
Vieyra, B. E., with others, electrical engineering aspect of degaussing, **842**
Vigoureux, P., electroacoustic transducers, **2662**; quartz oscillators, **2703**
Villard, O. G., Jr, overmodulation splatter suppression, **1625, 3701**; radio detection of meteors, **3101**; weak-signal narrow-band f.m., **2907**
—— with others, meteor detection by radio, **1417**
Ville, J., with others, impedance deviations in cable sections, **3779**
Villey, J., electric amplification in metrology, **1875**
Violet, F., A. Danzin and A. Commin, glass in the radio industry, **3319**
Visking Corporation, polythene plastics for packaging, **773**
Vladimirov, I. A., surface sensitivity distribution of Se photocells, [illegible]
Voce, E., Cu and Cu alloys, **1484**
Voge, J., electron bunching in v.m. valves, **1646**; mechanism of magnetron, **948**
Voge, J. P., with others, theory of travelling-wave valve, **3421**
Vogel, C. P., and W. J. Dodds, stabilized magnetron, **3737**
Vogel, T., vibrations of coupled systems, **2728**
Volkenstein, F. F., photoelectrically inactive absorption of light by semiconductors, **(A) 1828**
Volkmann, J., with G. M. Nixon, recording studio design, **2314**
Volman, I. I., receiving vibrator in waveguide, **3784**
—— and A. I. Shpuntov, vibrator in rectangular waveguide, **3789**
Volpert, A. R., aerial feeder reflectometer, **3801**
Vonberg, D. D., with M. Ryle, 175 Mc/s solar radiation, **89**
Vonsovsky, S., ferromagnetic interaction of valence and inner electrons, **2074**
Vormer, J. J., artificial electrical twinning in quartz crystals, **1463**
de Vos, P. J. G., and S. J. du Toit, production of penetrating particles by cosmic radiation, **95**
—— K. Gürgen and S. J. du Toit, G-M counter, **1145**
de Vries, G., with C. G. A. von Lindern, flat cavities as electrical resonators, **3463**
Vvedenski, V. A., storm indication by radio locators, **2438**

W

Wachter, H., and J. W. A. van der Scheer, oil diffusion pump tests, [illegible]
Wack, P. E., resistivity of conducting rubber, **(A) 3168**
—— R. L. Anthony and E. Guth, electrical conductivity of rubbers with carbon black, **3557**
Wadley, T. L., ionosphere sounder, Johannesburg, **3121**
Wadsworth, J. C., 6-wire transmission line feeder system, **1686, (D) 2888**
Waffler, H., cosmic radiation variations on the Jungfraujoch, **2414**
Wagener, S., with H. Stahl, production of thin metallic films by vaporization, **1414**
Wagener, W. G., tetrodes *vs* triodes, **(A) 3725**
Wagner, H. M., and J. F. Herrick, self-switching r.f. amplifier, **3443**
Wait, G. R., ionization of air by ultraviolet light, **(A) 3858**
Wakeman, R. P., u.h.f. television propagation, **3256**
Waldmeier, M., provisional sunspot numbers, July–Sept. 1946, **1762**, Oct.–Dec. 1946, **3106**, Jan.–March 1947, **3879**; structure of solar atmosphere, **2409**
Walén, C., theory of solar magnetic field, **1756**
Walker, A. H. B., electronic pressure indicator, **1553**
Walker, G. B., theory of equivalent diode, **949**
Walker, G. D., radio communication network for the South African railways, **2942**
Walker, J., thermistors at h.f., **766**
Walker, J. H., low-power transmitter for 1.8 and 3.5 Mc/s, **565**
Walker, L. E. Q., with H. M. Dowsett, Handbook of Technical Instruction for Wireless Telegraphists, **(B) 326**
Walker, L. R., and N. Wax, non-uniform transmission lines and reflection coefficients, **2871**
Walker, R. C., commercial applications for picture telegraphy, **2951**
Walker, R. Y., with G. O. Thacker, magic-eye tuning indicators, **1255**
Walker, S., with others, dielectric absorption of solutions, **2839**
Walkinshaw, W., short Yagi aerials, **1348**
—— with H. G. Booker, mode theory of tropospheric refraction, [illegible]
Wall, T. F., Principles of Electrical Engineering, **(B) 4104**
Wallace, R. L., Jr, with others, noise reduction in aircraft, **3405**
Wallauschek, R., travelling-wave amplifier using dielectric waveguide, **1317**
—— with others, theory of travelling-wave valve, **3421**
Wallenstein, J. P., with others, 800-Mc/s triode, **1635**

Wallin, G., and C. W. Dymond, v.h.f. tuner design, (A) 1026, 3265
Wallis, C. M., space-charge division in power tetrode, 2625
Wallis, P. J., and S. G. Tomlin, current and power in v.m. valves, (D) 2272
—— with A. W. Gent, impedance matching of tapered transmission lines, 1331
Waloff, D., with A. E. Adams, torque motor, 247
Walter, W. Grey, and A. A. Brooks, portable 2-channel amplifier and recorder, 3478
—— with G. R. Baldock, electronic l.f. analyser, 794
Wannamaker, W. H., Jr, vane-actuated controller, 3444
Wantuch, E., G-M counters, 3207
Ward, D. A., magic eye as null indicator, (D) 2607
Warmoltz, N., ignition in Hg-arc rectifiers, (A) 3670 ; Hg switch potential distribution, 2250
Warnecke, R., u.s.w. valves, 3714
Warren, G. W., with M. R. Gavin, deflected beam valves for u.h.f., [illegible]
Warren, S. R., Jr, exposure to X rays and γ rays, 973
Wass, C. A. A., negative feedback, 372
Wassell, H. C., and D. A. Turner, effects of degaussing on ships' magnetic compasses, 844
Wassell, H. J. H., telegraph hand key design, 1232
Wassermann, I. I., with V. I. Kalinin, electron oscillations in magnetron, 3729
Wathen-Dunn, W., absolute calibration of gramophone test records by light patterns, (A) 2307
Watson, A. G. D., with H. R. L. Lamont, mm wave propagation, 1903
Watson, D. S., with others, c.r. tube problems in Service radar applications, 2984 ; naval fire-control radar, 1798
Watson, J. M. S., portable d.f. receiver, 2778
Watson, R. B., and C. W. Horton, radiation patterns of dielectric rods (A) 3794
Watson, W. H., matrix theory for transmission line and impedance calculations, 1329 ; Physical Principles of Wave Guide Transmission and Antenna Systems, (B) 2689; resonant slots, 1360, (A) 1685
Watson, W. W., with others, cavity accelerator for electrons, 3899
Watson-Watt, R. A., British radar developments, 104
Watt, B. E., current integrator, 1152 ; high speed pulse recording circuit, 1149
Watts, C. B., with F. L. Moseley, automatic radio flight control, (A) 1089, 3141
—— with others, aircraft u.h.f. course indicator, 1094
Watts, D. E., G. F. Leland and T. N. Willcox, dielectric preheating in plastics industry, (A) 1154
—— with others, dielectric preheating for plastics, (A) 1154, 3225
Watts, R. J., and D. Williams, microwave absorption of NH_3, (A) [illegible]
Wax, N., with L. R. Walker, non-uniform transmission lines and reflection coefficients, 2671
Waynick, A. H., microphony in triodes, 2981
Webb, E. K., h.f. response of a.f. transformers, 1688
Webb, R. C., with others, colour television system, 2958
Webber, R. T., magnetic transition curves in superconducting Ta, (A) 3149
—— and C. T. Lane, all-metal vacuum gauge, 116
Weber, G., Über Frequenzmodulatoren für Ultrahochfrequenz, (B) 567
Webster, D. L., electron motion through ferromagnets, (A) 1064
Webster, N. D., and F. C. McPeak, experiments in listening, 3007
Wechsler, V., N. Dobrotin and V. Khvoles, highly ionizing particles in cosmic radiation, 1765, 2763
—— L. Groshev and L. Lazareva, penetrating showers in cosmic rays, 1440
—— with others, cosmic rays, intensity measurement, 3883, intensity at 3860 m and 5000 m, 3884, penetrating showers at 3860 m, 1441
van Weel, A., f.m. u.s.w. receiver for R/T, 3263 ; 48-channel f.m. transmitter, 2606, 3705
Weidler, R. C., with others, infra-red spectrum of H_2O and D_2O, (A) 3846
Weigel, M., with others, a.m. broadcasting for small communities, (A) 2245
Weikel, J., with others, counting rate and frequency meter, 480
Weiller, P. G., economics of electronic devices, 318
Weimer, D. K., with A. W. Smith, magnetostriction gauge for supersonic intensities, 3580
Weimer, P. K., H. B. Law and S. V. Forgue, mimo, miniature image orthicon, 2959
Weinberg, F. I., with V. V. Vargin, luminescence of glasses, survey, 1813
Weinreich, O., oxide cathodes, 2979
Weintroub, S., anti- and high-reflection optical films, 711
Weiss, A., with R. D. Huntoon, synchronization of oscillators, 3467
Weissenberg, A., with A. Alichanian, cosmic rays at 3 km height, 1763
—— with others, cosmic rays at 3 km height, 1423
Weissler, P. G., with others, thermal voltage of quartz crystal, (A) 3848
Welch, H. W., with W. G. Dow, resnatron, (A) 1224, 3348
—— with H. C. Early, self-regulating field excitation for magnetrons, 1642
—— with others, Purdue microwave electron accelerator, (A) 1540
Welge, V., radio control of model flying boats, 2888
Weller, C. T., characteristics of thermocouples, 815
Wells, E. M., radiation resistance of aerials with travelling wave, 2682
Wells, H. D., and R. I. Reed, f.m. and television power valve and grounded-grid cavity, (A) 3337
Wells, H. G., ionosphere recorder, (A) 3518
Wells, H. W., sporadic-E ionization at Watheroo, 1445
—— and A. H. Shapley, eclipse effects in F_2 layer of ionosphere, 502
Wells, J. S., feedback amplifier charts, 1717
Wentink, T., Jr, with others, microwave absorption, of carbonyl sulphide, (A) 3872, of NH_3, 3096
Wentzel, G., recent meson theory, 3514
Wesson, L. G., with A. von Hippel, polystyrene plastics as h.f. dielectrics, 763
West, S. S., electronic decimal counter chronometer, 2190
—— and L. C. Bentley, electronic millisecond timer, 3568
Westcott, C. H., with D. Taylor, divided broadside aerials for 200 Mc/s, 1355
Westendorp, W. F., biased betatron, 2525
Westmijze, W. K., noise reduction in sound-film reproduction, 3417
Weston, J. D., unification of linear network theory, 38
Westwater, F. L., measurements of refractive index gradient in lower troposphere, 413
Whaley, H. R., directive aerials, 3032
Whaley, R. M., with others, Purdue microwave electron accelerator, (A) 1540
Whalley, W. B., with others, pulse triodes for 1 MW at 600 Mc/s, 2982
Wheeldon, G. E., with others, automatic control in chemical industry, (A) 4039
Wheeler, G. J., with O. T. Fundingsland, constant current circuits, 670
Wheeler, M. W., cavity resonators, (A) 3465
Whiffen, D. H., and H. W. Thompson, absorption of microwaves by liquids, 2842
Whinnery, J. R., with A. M. Gurewitsch, microwave oscillators using disk-seal valves, 2709
Whitaker, J. N., mono-sequence tuning, 3322 ; 100-kc/s frequency standard for receivers, 2180
Whitby, G. S., with H. Mark, (Eds), Advances in Colloid Science, Vol. 2, (B) 1837
White, C. F., and M. R. Boyer, film for television tube photography, 907
White, S. Y., resonant filter design, 3074 ; supersonic applications, 3756 ; tunable receiver for v.h.f., 2913
White, W. C., industrial uses of electronic equipment, 2520, 3607 ; microwaves and industrial electronic control, 209
Whitehead, J. W., v.h.f. fading due to aircraft reflections, 850
—— with P. J. Brine, null indicator for impedance bridge measurements, 1516
—— with D. F. Livingstone, choice of materials for tropical radio equipment, 2142
—— with R. Terlecki, capacitance abac for use with avometer Type D, 805 ; receiver operation on 28V, 3261
Whitehead, S., analysis of dielectric measurements, 2741
Whiteley, A. L., servomechanisms, and automatic regulators, (A) 4039, theory of stabilization, 245
Whittenton, J. M., and C. A. Wilkinson, frequency compensated ammeters and voltmeters, 802
Wickizer, G. S., on-off and frequency-shift telegraph keying, 3702
—— and A. M. Braaten, propagation at 45.1, 474 and 2800 Mc/s, [illegible]
Widdis, F. C., with D. C. Gall, high impedance a.c. voltmeter, 1514, (D) [illegible]
Widemann, J. A., television, vertical and horizontal definition abac, 1600
Widnall, F., and R. Newbound, protective finishing of electrical equipment, (A) 3543
Wiener, F. M., sound diffraction, by spheres and cylinders, 3390
—— with A. L. DiMattia, pressure calibration of capacitor microphones, 334
—— with J. P. Egan, speech intelligibility in noise, 335
Wight, F. P., airborne radar test gear, 188
Wilbur, D. A., magnetrons for continuous operation, (A) 294
Wilchinsky, Z. W., and R. H. Kyser, air-flow u.h.f. wattmeter, 187
Wilcock, D. F., silicone oils, and applications, 750, 1461
Wilhelm, H. T., measurement of high resistance, 3190
Wilkes, M. V., Eniac calculating machine, 2481 ; oblique ionosphere reflection of very long waves, 2548
—— and J. A. Ramsay, radar and ship targets, 2904
Wilkinson, C. A., with J. M. Whittenton, frequency compensated ammeters and voltmeters, 802
Wilkinson, E. J., h.f. aerial systems and transmission lines, 2672, 3791
Wilkinson, R. I., Japanese radar, 424, (A) 3538
Willard, G. W., supersonic absorption and velocity in liquid mixtures, 1975 ; supersonic waves made visible, 3754
Willcox, T. N., with others, dielectric preheating for plastics, (A) 1154, 3225
Willey, E. J. B., amplitude control in RC oscillators, 3825
Williams, A. E., progress in plastics, 150
Williams, A. J., Jr, input transformer problem, (A) 2248
Williams, A. O., Jr, acoustic wave fronts from piston source, 1977
—— with L. W. Labaw, supersonic absorption in water near 1 Mc/s, 1884
Williams, D., visual measurement of receiver noise, 2570
—— with R. J. Watts, microwave absorption of NH_3, (A) 3869
—— with others, infra-red spectrum of H_2O and D_2O, (A) 3846
Williams, E. J., and D. W. Heightman, skip distance effect on λ 5 m, (D) [illegible]
—— with D. W. Heightman, propagation of 5-m waves, 1179
Williams, E. M., with E. O. Willoughby, attenuation curves for various waveguides, 1327
Williams, F. C., and F. J. V. Ritson, electronic servo simulators, (A) 4039
Williams, H. P., empirical formula for wave propagation within optical range, 1184
Williams, J. A., Zn-base finish for steel parts, 2821
Williams, L. E., battery-operated h.v. supply, 258
Williams, R. C. G., radio and television receiver servicing, (AD) 222, 2224, (A) 3840 ; tuning devices for broadcast receivers, 1194, (A) 1918
—— and others, automatic circuit tester for mass production, 2181, (A) 3198
Williams, R. W., and B. Rossi, air showers at 11500 ft, (A) 3882
—— with B. Rossi, nuclear disintegrations at 11500 ft, (A) 3882
Williams, S. B., relay computer, 2482
Williams, S. E., and P. Hands, solar radiation on 75 Mc/s, (A) 405
Williams, T., impregnated transformer windings, (D) 134
Williamson, D. T. N., high-quality amplifier design, 2715
Williamson, J. W., with J. T. Vaughan, design of induction heating coils for cylindrical magnetic loads, 2876
Willis, F. H., with others, reflection of sound signals in troposphere, 339, (A) 3751
Willoughby, E. O., field plotting for transmission lines, (A) 630
—— and E. M. Williams, attenuation curves for various waveguides, 1327
Wills, W. P., d.c. to a.c. conversion systems, (A) 2248
Willshaw, W. E., with others, u.h.f. radio measurements, (D) 1130
Wilson, D. A., and L. N. Liebermann, attenuation of sound in water, (A) 2307
Wilson, E. B., Jr, with R. H. Hughes, microwave spectrograph, 3205 ; network for solution of secular equations, 3562
Wilson, I. G., C. W. Schramm and J. P. Kinzer, high-Q resonant cavities for microwave testing, 378
—— with J. P. Kinzer, currents in walls of cylindrical cavity resonators, 3464
Wilson, J. G., mesons, momentum spectrum, 718
Wilson, J. T., medical applications of radioactive materials, (A) 1154
Wilson, W., application of electronics, (A) 1532
Wilson, W. R., amplifiers for PbS photocells, (A) 3833
—— with others, modulation of Cs arc, (A) 4023
Windred, G., Gas-Filled Triode, (B) 1275 ; parallel operation of gas-filled triodes, 950
te Winkel, J., carrier telegraphy, 3270
Winner, L., Rochester Fall Meeting, 1946, 3299
Winson, V. H., colonial telecommunication, (AD) 1209
Winspear, G. G., and others, hard rubbers, (A) 780
Wintermitz, T. W., gain of feedback amplifiers, 50, (A) 3456
Wireless World, aerial, invention of, 4100 ; army No. 10 set, 236 ; automatic receiver production, 2556 ; circuit conventions, valve equivalent generator, 2380 ; communication receiver, B40, B41, 860, V55R, 1192 ; Consol d.f. station, 1788 ; Decca navigator, 1787 ; Ekco A28 receiver, 1914 ; exhibition of aircraft radio equipment, 421 ; frequency bands for communication channels, 4026 ; frequency and wavelengths classification, 2650 ; I.E.E. radio-communication convention, 3377 ; interference suppression conference, 1924 ; magnetic recorder, 2321 ; magnetophon recorders, 2320 ; metal lenses, 2015 ; Murphy receiver, 859 ; permanent magnets, 3936 ; pulse modulation terminology, 237 ; Pye television receiver, 919 ; radar definitions, 740 ; Radio Amateur Call Book, 1292 ; Radio Component Manufacturers' Federation exhibition, 2722 ; radio equipment in S.S. *Queen Elizabeth*, 529 ; R.C.A. television gear, 555 ; RC coupling, 2353 ; super-regenerative receiver for v.h.f., 1193 ; telegraph key design, (A) 1950 ; television outside broadcast vehicle, 3685 ; television receiver construction, deflector coils, 1245, 1953, frame coils, 2595, line timebase and h.v. supply, 3687 ; Television Receiving Equipment, (B) 2268 ; tropical broadcasting, India, (AD) 2580 ; use of μ, 960 ; use of term 'electronics', 2294 ; valve base standardization, 980 ; v.h.f. broadcasting, 388 ; video amplifier h.f. response, 61, 62, 681 ; wide-band amplifier design, 1045 ; WWV standard frequency transmissions, 2484
Wirz, P., acoustic resonators, 2657
Wise, M. E., with H. A. Klasens, luminescence decay in ZnS phosphors, 2135
—— with others, ZnS phosphor with ultraviolet excitation, 3919
Witchell, W. M., Greenwich Observatory, 1284
Wittenberg, H. H., frequency performance of thyratrons, 1267
Wolf, A., field of dipole on two-layer earth, 3435 ; parallel-T RC network, 40
Wolf, E., war of broadcasting, 3379
Wolf, L. J., triplex aerial for television and f.m., 3797
Wood, H. M., with J. T. Ralph, BC-645 transmitter-receiver, 1957
Wood, K. A., 200-Mc/s radar interrogator-beacon systems, 1791
Wooding, R. A., Jr, phase modulator, 2714
Woodland, P. C., with others, dielectric properties of polymers (A) 3170
Woodward, A. M., transmission in waveguides, 3423
Woodward, L., with A. R. Ubbelohde, structure and thermal properties of crystals, 1748
Woodward, O. M., Jr, comparator for coaxial lines, 3016
—— with G. H. Brown, circularly-polarized omnidirectional aerial, [illegible]
Woodyard, J. R., and others, excitation of high-Q cavity, (A) 1033
Wooldridge, D. E., signal and noise levels in magnetic tape recording, (D) 619
Woollett, L. G., home-made midget receiver, 862
Woolley, R. v.d. R., mechanism of ionospheric ionization, 416, 1446 ; radiative equilibrium in ionosphere, 2422
Wooster, W. A., control of twinning in quartz, 2141
Worcester, W. G., and E. G. Doughty, mass spectrometer for leak detection, 2793
Worthy, W. D., with H. Motz, magnetic field calculations by relaxation method, (D) 156
Wreddon, J. H., with H. W. Chatfield, Varnished Cloths for Electrical Insulation, (B) 152
Wright, A., television receivers, 3688, automatic frequency and phase control in, 2599
—— and E. Clark, television receivers, (A) 3686
Wright, A. B., amateur band superheterodyne, 1916
Wright, B. T., and J. R. Richardson, f.m. cyclotron characteristics, (A) 1164
Wright, H. M., with F. W. Tomlinson, mineral-insulated metal-sheathed conductors, 12, (A) 629, (D) 2323
Wright, P. B., television link tests in S. California, 552
Wright, S. B., and others, R/T for rural communities, 3659
Wul, B., (B. M. Vul), materials with high dielectric constant, 1473
Wulf, O. R., and S. B. Nicholson, tidal motions of the atmosphere, [illegible]
Wulfsberg, P., broadcast remote amplifier, 1218
Wwedenski, W. A. See Vvedenski, V. A.
Wyant, R. A., contact resistance in spot welding, (D) 772
van der Wyck, C. T. F., e.m. propagation in medium with non-uniform characteristics, 849
Wyckoff, H. O., with others, X-ray absorption measurements, 836
Wynn, R. T. B., continuity working in broadcasting, 4033

Y

Yadoff, O., extinction of sparks by electric fields, 1740
Yager, W. A., and R. M. Bozorth, ferromagnetic resonance at microwave frequencies, 3861
Yalow, A., with B. Parzen, theory and design of reflectometer, 3968
Yard, E. M., flame radiation measuring instrument, 826
Yates, E. L., automatic furnace temperature control, 490
Yeh, Chai, effect of space-charge on positive-grid oscillator frequency, 1969
Yngve, V., with others, mesons, latitude effect up to 35000 ft, (A) 3882
Young, C. H., interelectrode capacitance measurement, 1134, 2488
Young, J. E., and W. A. Harris, 12-channel f.m. converter, 1187
Young, N. H., colour-television transmitter for 490 Mc/s, 2592 ; television transmitter, for black-and-white and colour, (A) 1239, 3311
Young, V. J., with J. E. Browder, loop-aerial input circuit design, 2683
Young, W. R., Jr, interference between v.h.f. communication circuits, (A) 1188, 3267
Yuan, L. C. L., u.h.f. direction finding, 732, 1087
Yudin, M. I., location by three cross bearings, 103

Z

Zaalberg van Zelst, J. J., stabilized amplifiers, 3063
Zadeh, L. A., minimum phase-shift networks, 2699
Zaidel, A. N., luminescence of rare-earth salts, 1811
Zarem, A. M., memory oscillograph, (D) 897
Zaret, M. E., with others, midget earphones for military use, 347
Zatsepin, G. T., with others, lateral extension of Auger showers, 2765
Zayentz, S., with V. Hey, pulse corona, 2399, discharge paths, 2398
Zelbstein, U., background noise in amplifiers, 1200 ; grid current, 4075 ; measurement of Q, 2492
Zeluff, V., e.s. painting, 1883
Zenner, R. E., with J. S. Boyers, master wire sound recorder, (A) 2307
Zerbini, V., with B. Lavagnino, electromotive pulse transformer, 2690
Zernov, D. V., secondary emission from thin dielectric films, 571
Zhabotinski, M. E., systems with two degrees of freedom, 377
—— with others, frequency stabilization theory, 363
Zhdanov, G. B., with others, cosmic rays, intensity measurement, 3883, intensity at 3860 m and 5000 m, 3884
Zickendraht, H., bridge circuit for relaxation oscillations, 2362
Zickner, G., edge correction for capacitors, theory, [illegible]
van der Ziel, A., diode damping, 3344 ; grounded grid amplifiers, 3474
—— and A. Versnel, total emission noise in diodes, 2243
Zieler, H. W., with others, resolution in electron microscopes, committee report, 1889
Zimmerman, K., with F. A. Muller, attenuation test equipment for v.h.f. transmission lines, (A) 2490
Zimmermann, K. H., spiral delay lines, 2009
Zingerman, A., and N. Nikolaevskaya, mechanism of discharge, 399
Zink, A. J., Jr, stability of crystal oscillators, 2704 ; 100 kc/s–50 Mc/s frequency meter, 2179
Zucker, M., low-reactance flexible cable for induction heating, 1001
Zuhr, H. F., with R. B. Jacobs, developments in vacuum engineering, 2440
Zuos, F. A., optical proximity fuse, 2540
Zurcher, M., flashpoint of organic insulating materials, 41
Zwicker, B., and P. Scherrer, electro-optical properties of KH_2PO_4 and KD_2PO_4, 2450
Zworykin, V. K., aerial torpedo, with television control, 2962 ; R.C.A. television projection system, 4064 ; television, modern apparatus, 4050
—— and L. E. Flory, electronic reading aid for the blind, 3229
—— and others, Electron Optics and the Electron Microscope, (B) 1174

SUBJECT INDEX

SYMBOLS (A) Abstract, (B) Book Review, (C) Note of Correction, (D) Discussion

A

- **Abacs,** construction, 1126
- **Absorption** (See also Acoustics ; Ionosphere ; Sound)
  - acoustic, measurement, by phase-shift determination, 2658, by stationary wave method, 340
  - of various materials, 3763
  - microwave, anomalies in NH$_3$ spectrum, 3871
    - atmospheric, 1843
    - in benzene and liquid paraffin, 2841
    - of carbonyl sulphide, (A) 3872
    - by gases, thermal and acoustic effects, 2757
    - of HDO, (A) 2390
    - of H$_2$O and D$_2$O, 693
    - of linear molecules, 1732
    - by liquids, 2842
    - of NH$_3$, 69, 1399, 3096, 3507, (A) 3868, (A) 3869, 3870
    - of N^{14}H$_3$ and N^{15}H$_3$, 3097
    - of oxygen, 3098
    - of solutions of polar substances in non-polar solvents, 2839
    - of water and related molecules, 3099
    - of water vapour, (A) 219, 1562, 3100
  - nuclear, in magnetic field, 708
  - resonance, paramagnetic, at 9000 Mc/s, (A) 3866
  - spectra, r.f., of solutions of electrolytes, 2731
  - supersonic, in liquid mixtures, 1975
    - in liquids at 75–280 Mc/s, 3752, at 100–225 Mc/s, (A) 3753
    - in water near 1 Mc/s, 1984
- **Acceleration,** measurement by radio methods, 1525 ; vacuum-tube pickup, 2528, (A) 4001
- **Accidents** See Safety
- **Acoustics** (See also Absorption ; Impedance ; Sound)
  - architectural, 2313 ; absorption of non-uniform walls, 342, (A) 3764 ; broadcasting studio design, 2659, 3008, 3766 ; convex wood splays for studios, (A) 2307, 3410 ; correction by diffusion, 343 ; of disk-recording studios, (A) 2307, 3409, 3010 ; f.m. studio design, 2660 ; Oelsner method, 5 ; silent room, 968, 3002 ; studio design criteria, (A) 2307, 3411 ; tests in theatre, 3406
  - artificial ear experiments, 3769
  - bibliography, 2306, 3386, 3747
  - directional radiation of vibrating disk in baffle or horn, 328
  - impedance measurement, 3402
  - intensity levels, survey, 327
  - listening tests, 3007, 3765
  - measurements, standard microphone and regulator for, 1306
  - noise reduction in aircraft, 3405
  - power distribution, 2317
  - problems in broadcasting, 1307
  - radiation theory, 1304
  - resonators, properties of, 2657
  - studio and speech-input equipment, 350
  - wave fronts from piston source, 1977
  - wavelengths of sound in various media, 2309
- **Aerials** (See also Broadcasting stations ; Coupling ; Radar apparatus ; Television apparatus ; Transmission lines ; Wave propagation, e.m. ; Waveguides)
  - aircraft, automatic pattern drawing, (A) 1004, 2684, (A) 3031 ; cavity, 1346 ; for m λ radar, 1341
  - arrays, gain *vs* element spacing, 3427
  - auxiliary functions, 22
  - beam, helical, 3033
    - rotary, for 14 and 28 Mc/s, 640, for λ 2 m, 643
  - broadcast, installation, 637
  - for circularly polarized waves, 1009
  - common, transmitting and receiving, for radar, 1340
  - cone and cylindrical, with mirrors, 3426
  - cylindrical, Hallén's integral equation for, (D) 2333
  - dielectric, radiation patterns, (A) 3794, rod and tubular, 355
  - dipole, cylindrical, impedance, 1338
    - receiving, 1334
    - reflector, insulation, 357
    - transmitting, radiation resistance and aerial shortening, 1344
    - wide-band, 1010
    - with unbalanced feeder, 646
  - directive, 3032
    - analyser for, 1337
    - beam, for λ 1½ m, 1356
    - broad-band, design, 1350
    - for broadcasting, (B) 3438
    - broadside arrays, for 200 Mc/s, 1355, current distribution, (D) 2685, performance, 1351
    - calculator for, 1014
    - crossed-dipole, 1347
    - double triplex beam, 1680
    - for frequencies above 28 Mc/s, 1354
    - switched-beam, 600 Mc/s, 1681
    - Yagi, gain, 1349, theory, 1348
    - 4-element array, construction, 2336
    - 5-band array, 3.5–28 Mc/s, 638
    - 6-m and 10-m arrays, 1675
  - double dipole, for 45 and 90 Mc/s simultaneously, 3433
  - feeders for 6-wire transmission line system, 1686, (D) 2688
  - f.m. broadcast, design, (A) 3027, using waveguide principle, 3798
  - folded dipole, input impedance, 3428
  - folded unipole, 30–44 Mc/s, 636
  - h.f., 2672, 3791
  - half-wave dipoles, mutual effects, 23, (C) 1011, 2013
  - introduction to theory, (B) 2338
  - invention of, 4100
  - kytoon for erection of, 27
  - line-of-sight, 1339
  - long-slot, (A) 1004, 3034
  - loop, circular, radiation from, 24, (A) 1012
    - for f.m. broadcasting, 3030, 3431
    - input circuit design, 2683
    - screened, impedance of, 25, 2014
  - metal-lens, 1013, 2015, (A) 3802
  - microwave, dielectric housings for, 1343
    - dielectric lens, for wide-angle beam scanning, 1358, (A) 1682
    - dipole with parabolic mirror, polar diagram, 1357, (A) 1683
    - omnidirectional, 2678
    - projectors for, 1622
    - spherical reflectors for scanning, 1342
  - models for design and characteristic determination, (A) 2011
  - omnidirectional, circularly-polarized, 3425
    - with concentric feeder, 3434
    - vertically polarized, for trains, 641
  - open, partially screened, 2681, (D) 3800
  - paraboloid, parallel-plate optics for rapid scanning, 2679
  - polar diagrams, survey, 1333
  - power gain measurement, effect of re-radiation, 1345
  - radar, 3795, survey, 358
  - radiation, physical interpretation, (A) 2335
  - radiation patterns, measurement, 2016, plotting, 2017
  - radiation resistance with progressive wave, 2682
  - receiver, couplings for medium waves, 2010
  - recent theories, 2331 ; 2012, 2332, 2676
  - rhombic, directional patterns, 644
    - horizontal, generalized radiation formula, 1015
    - and matching circuits, 1678
    - r.f. measurements, 1857
    - for television, 26
  - slot, design for specified radiation pattern, 1352
    - polar diagrams and impedance curves, 1677
    - relation to wire aerials, 1335
    - and slot feeders, 1336
    - survey, 1360, (A) 1685
  - square-loop, for f.m. broadcasting, 2334
  - television, close-spaced arrays, 3799
  - theory, (B) 28
    - and practice, 21
    - uses of Fourier transforms, 2680, 3561
  - thermal equilibrium of, 642
  - transmitting, rotary, five-element, 645
  - triplex, for television and f.m., 3797
  - vertical, coaxial, λ 10 m, construction, 639
    - 2500 ft high, 2677
  - wide-band, design problems, (A) 1004, (A) 3026
    - linear array, 1353
    - 20–85 Mc/s, 1318
- **Air,** ionization and electrification, effect of water drops, 1449
- **Aircraft** (See also Aerials ; Blind landing ; Control ; Navigation ; Precipitation static)
  - electrostatic ills and cures, 2916
  - radio-controlled, for atomic bomb observations, 497
- —— **communication,** aerials, cavity, 1346
  - air-to-ground, 887
  - survey, 2129
- —— **electrical equipment,** exhibition, 421
- **Alloys** (See also Ferromagnetic materials ; Magnetic materials ; and individual substances)
  - Al, developments, 2470
  - electrical resistance, Kumanal, 148
  - Fe-Ni, domain distribution, 2137
  - Fernico, from metal powders, 1482
  - hiperco, 2820, 3946
  - light, metallic joining, 2152, 2467, 3943
    - use for capacitors, 544, 1226, 1593, 1946
  - Mg, high-temperature oxidation, 2156
  - Pb, for cable sheathing, (D) 2822
- **Altimeters,** aneroid barometers as, 968
  - radio, f.m., Aviasol, 3912
- **Aluminium,** atmospheric oxidation, 130
  - for cable sheathing, 1470, 1471
  - in electrical industry, 1233
  - in industry, 2471
- **Amateur radio,** A.R.R.L. handbook, 1946 edn, (B) 1303, 1947 edn, (B) 3385
  - call sign book, (B) 1292
  - frequency bands, 2575, subdivision for c.w. and phone, 1580
  - 5-m equipment from existing equipment, 1935
- **Ammeters,** a.c., frequency-compensated, 802
- **Amplidyne** (See also Control, remote)
  - control system, 2944 ; industrial applications, 821
- **Amplification,** u.h.f., by klystron, 3355, 3481
  - of weak photoelectric currents, 1714
- **Amplifier circuits** (See also Cathode followers)
  - anode follower, 2050
  - gain and sensitivity for m and dm waves, 3067
- **Amplifiers** (See also Feedback ; Radar ; Television apparatus)
  - a.f., a.c./d.c., 2369
    - with automatic bias, 3835
    - class B, 623
    - high-fidelity, 1047
    - high-gain, hum, 1689
    - narrow-band, 3484
    - portable 2-channel with recorder, 3478
  - background-noise, 1200
  - balanced, 2370
  - band-pass, design, 3065
  - bridge, parallel-T, 2051, (A) 3071
  - broad-band, (A) 3479
  - carrier-type, for electric gauges, 2871
  - cathode-biased, degenerative, graphical analysis, 2367
  - cathode-coupled, graphical analysis, 3066, triode, 2046
  - cathode-follower, input admittance, 3064
  - class A, load conditions, 1044
  - class B, with grid excitation of arbitrary waveform, 385
  - constant gain, for i.c.e. knock measurement, 1551
  - d.c., contact modulated, 1512
    - with modulated carrier, 679, (D) 1048
    - stabilized, 3482
    - valve coupling for, 60
  - for disk recording, 618
  - effect of sudden e.m.f., 3475
  - feedback, (A) 3483
    - charts, 1717
    - gain and impedance configuration, 50, (A) 3456
  - galvanometer, with negative feedback, 1513
  - grounded-grid, theory, 3474
  - high-quality, design, 2715
  - i.f., broad-band, 678
    - capacitance-coupled, 2036
    - for high-gain f.m. receiver, 2368
    - radar, characteristics of valves for, 937, lightweight, 3069
  - l.f., resistance, 999
  - linear, design for single sideband transmitters, 3704
  - magnetic, 1042
  - n-stage, oscillation conditions, 677
  - noise-measuring, linearity range, 2718
  - output fluctuation, 2047
    - and shot effect, 2048
  - for PbS photocells, (A) 3833
  - permeability-tuned, for 100 Mc/s, (A) 1026, 3070
  - phase-splitting, twin-triode, 2038
  - power, cathode-excited, 2037
  - pulse and television, performance criteria, 3062
  - push-pull, for amateur use, 1716
    - automatic gain adjusting, 2371
    - with direct coupling, 2049
    - phase-splitter, 3837
  - RC, calculations, 386
  - r.f., for signal generator output, 1043
  - remote, for broadcasting, 1218
  - stabilized, 3063
    - using 813 beam tetrode, 1713
  - transmission of pulses through, 61
  - for transoceanic radio, 59
  - travelling-wave (See also Valves, travelling-wave), 2286
    - using dielectric waveguide, 1317
    - explanation by transmission line model, 1330
  - valve, tetrode, self-oscillation prevention, 58
  - v.h.f., 15-W, 3836
  - video, h.f. response, 61, 62, 681
  - wide-band, i.f., above 100 Mc/s, 3068
    - with stagger tuning, design data, 1045
  - 3-channel, 373
  - 550-Mc/s, (A) 3480
- **Analogies,** electric-magnetic, (D) 3364 ; electrical, for servo-mechanism analysis, 543, (D) 891, (D) 3287 ; electrical and mechanical, survey, 969 ; mechanical, for TE waves, 3844 ; use in teaching e.m. theory, 970
- **Analyser,** output, 2497
- **Anodizing,** 143
- **Antennalyzer,** 1337
- **Arc discharge,** current growth, 2068
  - initial current density, 2395
  - low-pressure, oscillations, 2067
  - mechanism, 2396
- **Astronomy,** measurement of interplanetary distances by radar, 105
- **Atmosphere** (See also Meteorology ; Sound propagation ; Wave propagation, e.m.)
  - computed currents, diurnal variations, 3906
  - conductivity measurement, 1140
  - low-level reflections, 2769
  - lower, ionic equilibrium, 2120
  - oscillations, (D) 3899
  - pressure and temperature to 120 km height, 3522
  - sodium equilibrium, 3126
  - sound rays in, 1988
  - stratified, refractive-index profile, 2894
  - stratosphere, constitution, 3517
    - temperature and pressure measurements, 2116
    - thermal structure, 3516
  - tidal motions, terrestrial influences, 3900
  - troposphere, effect on radio waves, (A) 1180
    - irregularities, and sound propagation, 330, (A) 3751
    - refractive index gradient measurement, 413
  - upper (See also Ionosphere)
    - basic properties and processes, 414
    - electron collision frequency in, 2420
    - V-2 rocket experiments, 3901
- **Atmospheric electricity** (See also Precipitation static)
  - influence of water drops, 1449
  - and lightning, theory, 3908
  - potential gradient at Tamanrasset, 1781
  - precipitation static and thunderstorms, 2425
  - and rate of ionization, 1782
  - theory, 1448
  - theory of thundercloud electrification, 1783
  - vertical currents, 3905
- **Atmospherics,** artificial, for receiver tests, 3639
  - correlation with solar activity, 1564
  - effect of λ on level, 2123
  - geographical distribution, relation to cold fronts, etc., (A) 2758
  - nature, and location, (A) 1786, and variations, 1784
  - propagation in waveguide between ground and ionosphere, 218
  - and sunspot cycle, 2122
  - use for storm location, 3132
- **Atomic bomb tests,** effect, on equipment, 837, geophysical, 837, on reception at Bangalore, 851
- **Attenuation,** of h.f. waves on 3-phase line, 2006
- **Attenuators,** decimal, general theory, 1388
  - electronic, 3485
  - with linear response, 3838
  - r.f., calibration, 3202, (A) 3972
  - S-band, 2254
- **Aurora,** and charged particle motion, 2426
  - height distribution in S. Norway, 1785
  - spectrum, 3904
  - theoretical luminosity curve, 417
- **Automatic control** (See also Servomechanisms)
  - by saturable reactors, 1228
- **Autotransformers,** general theory, 1362

B

- **Barium titanate,** dielectric and piezoelectric properties, 3547
- **Batteries,** dry, 2948, AgCl-Mg, 901, 3295, miniature, for tropical use, 547
- **Beacons** See Navigation aids
- **Bell, Alexander Graham,** life and work, 2645, 2646
- **Beta rays,** measurement of, 710
  - radiation losses, 77
- **Betatrons** (See also Electron accelerators) 833
  - biased, 2525
  - electron mechanics, 3997
  - magnetic field measurement, (A) 1160
  - out-of-phase field measurement, 2524
  - survey, 1541
  - synchronization with auxiliary apparatus, 3609
  - 2.8-MeV, 4000
  - 20-MeV, for flaw detection, 1884, 2206
  - 100-MeV, General Electric Co., (A) 1154, 3233
- **Bethenod, Joseph,** radio work of, 974, life and work, 2651
- **Bibliography,** television, R.C.A. papers, 1929–1946, 3301
- **Biological applications** (See also Amplifiers)
  - diathermy, 486 ; electroencephalograph, 1550 ; l.f. analyser, 794 ; medical probe, 2208 ; movements of beetles, 485
- **Blind,** electronic reading aid for, 3229
- **Blind landing systems,** C.A.A. instrument landing, 1792 ; survey of problems, 1093
- **Bolometers,** organic thermistor, 1518
  - rapid-response film-type, 1730
  - superconducting, for infra-red detection, 1527
  - for v.h.f. power measurement, 189
- **Boundary problems,** in e.m. theory, generalized conditions, (A) 1059, [illegible]
  - in mathematical physics, 2479
  - methods of solution, 1838
- **Breakdown** (See also Insulators ; Insulating materials)
  - of ceramic dielectrics at high temperatures, 2810
  - h.v., in vacuum, 3090
  - testing, of rubber-insulated wire, (D) 3180
- **Bridge circuits,** nonlinear, lamps for, 45, theory, (D) 44
- **Bridges** (See also Capacitance ; Impedance ; Measurement)
  - a.c., methods, (B) 196
    - precision, 3963
    - Wheatstone, 2854
  - impedance, h.f., 3960
  - r.f., equal ratio, for impedance measurement, 806
    - visual null indicator, 1516
  - unbalanced, graphical methods and chart for, 807
- **British Broadcasting Corporation,** draft charter, 2305 ; licence and agreement, 2304
- **Broadcasting** (See also Aerials ; Communication systems ; Modulation ; Relay systems)
  - acoustic problems, 1307
  - a.m., acoustic problems, 3009
  - civic sales and servicing, 978
  - compensation of temperature effects on music circuits, 3419
  - continuity working, 4033
  - emergency pickup techniques, 2949
  - f.m., preamplifier noise, 4063
  - in India, choice of wavelength, 1942
    - proposed metre-wave system, (AD) 2580
  - policy in Great Britain, (A) 320
  - post-war situation outside U.S.A., 1588
  - pulse technique, 1932
  - s.w., a.m., for small communities, (A) 2245
  - U.S. economics, 2300
  - v.h.f., [illegible] and various types of modulation, 1948
  - war of [illegible]
  - 500-ft B.B.C. mast, 20
- —— **stations** (See also Transmitters)
  - auxiliary transmitter for, 562
  - B.B.C. studio technique, 380
  - equipment, at Radio House, Copenhagen, 2988
  - f.m., engineering practice, 542
  - h.f., Shepparton, Australia, 2937
  - lightning protection, 879
  - preventive maintenance, 541
  - site selection and field strength surveys, 1984
  - studio equipment for 2GB, Sydney, 2989
  - studio-transmitter building, 1-kW, planning and construction, 2244
  - two stations using common transmitting towers, 878
  - WNEW control console, 2984

    world list, (B) 1223
— **systems,** carrier-frequency, 1214
    pulse-time multiplex, 3277, (A) 3656, 3657
    2-channel, single carrier, 1928
— **studios** (See also Acoustics)
    acoustical planning, 3766
    control unit, 1220
    installation planning, 4034
    sound effects, (B) 1600
Brownian motion, use for low temperature thermometry, 483, (D) 2185
Busbars, coaxial, inductance, (D) 631

C

Cables, air- and paper-insulated, for carrier current systems, 352
    coaxial, h.f., *vs* waveguides for telephony, (A) 1003
        impedance measurement, 1848
        optimum ratio of conductor diameters, 1664
        polythene, voltage characteristics, 3179, (A) 3959
        standing-wave indicator, 182
    coaxial pairs, impedance irregularities, 3782
    corona detection, 627
    h.f., fault location, 1002, (A) 1663
        use of polythene, 351
    impulse testing plant, 2848
    low reactance, for induction heating, 1001
    manufacturing processes, 3015
    metal-sheathed, mineral insulation for, 12, (A) 629, (D) 2323
    multicore, splicing with systematic permutation; 3778
    power, current rating in ducts, 13
    power-factor measurement, end-leakage prevention, 176, (A) 795
    r.f., characteristics, 174
        power rating, (A) 249
    with resistance and capacitance only, propagation, 628
    sheathing, use of Al, 1470, 1471
        use of Pb alloy, (D) 2822
    telephone, section impedance deviations, 3779
    terminations, (D) 2324, (D) 3420
    u.h.f. impedance measurement, 175
Calculations and calculating machines, A.C.E., 1157, 1493
    addition of parallel resistances, 2379
    automatic sequence controlled calculator, 461, 468, 787
    ballistic computer, 1494
    bridge-type electrical computers, (A) 2165
    developments, (AD) 2480, 3952
    Edvac computer, mercury memory tanks, 2828
    electrical, fundamental circuits, 3563
    electronic, 3953, Harvard Mark II, 2164
    electronic computer, for crystal structure analysis, (A) 3954
    Eniac, 462, 2481
    for linear simultaneous equations, 1839
    mechanical-transients analyser, (A) 1026, 3172
    network for solution of characteristic equations, 3562
    punched-card technique, 788
    relay, 2482
Calculus, operational, Heaviside, classes of formula, 783
        simplified, (B) 63, (B) 2831
Call signs, of countries, and Russian detail, 2573
Cameras (See also Television apparatus)
    shutter tester, c.r., 3220
Capacitance, interelectrode, measurement, 1134, 2488,
        meter for, 3966
    measurement with avometer, 805
Capacitors, edge correction, 1403
    in electronic circuits, (B) 684
    with impregnated cellulose, 2458
    manufacture, 3809
    for measurement, characteristics and errors, 481
    metallized, 1365
        paper, (A) 2029
        tests, 3175
    mica, in carrier current systems, 374, (A) 3458, (D) 3050
    overvoltage testing, 3575
    paper, accelerated life test, 1498
        with chlorinated impregnants, (A) 654, 655, (A) 3811
        hermetic, 3810
    use of light metals, 544, 1226, 1593, 1946
    vacuum, 1020
    variable, 1367
    various, characteristics, 653
Carbon, activated, effect of adsorption, 2083; colloidal, use in rubber industry, 1486
Carnegie Institution, work of Department of Terrestrial Magnetism, 1751
Carrier-current systems (See also Communication systems)
    using air- and paper-insulated cables, 352
    for h.v. networks, 2574
    mica capacitors for, 374, (A) 3458, (D) 3050
    power-line, field tests, 1207, (D) 3272
        for rural telephony, (A) 3271
    telegraphy, 3270
        merits of various systems, 528
    telephony, 531
    wired-wireless, receiver for signal-strength measurements, 1135
        for broadcasting, 1214
Cathode followers, abac, 2717, 3832, for pentodes, 3455
    circuit, (D) 3454
    graphical solution, 1373
    internal impedance, (D) 2023
    for microphone preamplifier, 3457
    driven by rectangular voltage wave, 1025
    with very low output resistance, (A) 663
Cathode-ray oscillographs, with d.c. amplification, 252
    design, (A) 1258, (A) 3191
    high-speed, for transients, 3587
    memory, (D) 897
    principles, (B) 1234
    for recording transients, 545
    for routine testing, 809
    trapezoidal distortion, origin, 1949
    universal, 1948
— **screens,** long persistence, 123, testing of, (A) 3921
    white, for television, and I.C.I. colour system, (A) 4051
— **tubes,** circuits, 658
    with cylindrical screen, 1640, (A) 4077
    deflecting systems, e.s. *vs* e.m. deflection, (AD) 304
    design, similitude theory, 300
    ion trap, 1268
    magnetic focusing and deflection, 303
    problems in Service radar applications, 2984
    for radar, war-time developments, 2983
    R.C.A. production technique, 2468
    for television, 2629
        distortion measurement, 808
    for visible speech, (A) 3398
Cathode sputtering, in gas discharge tubes, 592
Cathodes, design for electron-beam tubes, 4071
    oxide (See also Electron emission; Photocathodes)
        abnormal emission, (A) 281
        barium silicate interface, (A) 3158
        coating composition, 945
        development, 2979
        dissociation energy of surface films, 284
        effect on anode current variation, 2289
        effect of gold, (A) 283
        emission from, 573
        emission measurements, (A) 280
        interface, 946
        literature, 942
        manufacture of carbonates for, 3924
        pulsed properties of, 943
    semiconducting, electron emission, 1962
    strip, space charge and emission properties, 3328
    Ta cylinder, for c.w. magnetrons, 3728
Cathodoluminescence, 2062, 2063, as function of current density, (A) 3920
Cavity resonators, application to electron acceleration, 1708
    calculations, 1378
        of natural wavelength, 2041
        of properties by Rayleigh's method, 2040
    cylindrical, currents in walls, 3464
    effects of apertures, 1034
    and electron beams, 2706, (D) 3824
    equivalent circuit, (A) 1036
    field strength measurement, (A) 1131
    frequency-stable, (B) 1726
    graphical-numerical calculation, 3823
    h.f., calculation of parameters, 52, (A) 1028
    high-*Q*, method of excitation, (A) 1033
        for microwave testing, 378
    mathematical treatment, 1379
    natural frequencies, 379
    natural modes and effect of perturbations, 376
    perturbations and radiation pressure, 1707
    radiation through aperture, 375
    re-entrant, resonant frequency, 1706
    as u.h.f. band-pass filters, (A) 3465
    3-cm, (A) 3466
Ceramics (See also Insulating materials)
    with high dielectric constant, 759
    metallization, 1480
    porcelain, with low expansion and dielectric loss, 3550
    stress-strain relations, 453
Charts (See also Abacs)
    capacitance, for use with avometer, 805
    decibel conversion, 1842
    feedback amplifier, 1717
    for harmonic distortion calculation, 2026
    for parallel standard resistors, 680
    radiation, for f.m. stations, 3862
    for unbalanced bridge, 807
Chemical analysis, qualitative, by r.f. resonance, 2189
Chronograph, spiral, for millisecond intervals, 3569
Circuit analysis, coupled resonator frequency response, 54
    by laboratory methods, (B) 1054
    linear difference equations, 3476
    for *n* directly coupled oscillatory circuits, 380
    node-pair method, 39
— **breakers,** 1227
— **theory** (See also Calculus, operational; Matrix theory; Networks; Nonlinear problems; Transients)
    active and reactive power of dissipative network, 2700
    application of Riemann's number sphere, 1361
    calculation of inductance, (B) 683
    Campbell's theorem of random fluctuations, 29
    coupled circuits with *n* degrees of freedom, 43
    field of coil between two metal sheets, 2077, (A) 3502
    filters, and Tchebycheff polynomials, 652
    frequency-transposition systems, using Campbell's theory, 1368
    Heaviside's operational calculus, (B) 63, (B) 2831
    Laplace's transform, generalization of, 2478
    linear sweep generator, 656
    nonlinear regenerative circuits, 3052
    van der Pol's equation, 3814
    reflection in quadripoles and transmission lines, 2705
    self-excitation of electrical systems, 1703
    stability criteria, 2022
Circuits (See also Bridge circuits; Counter technique; Filters; Networks)
    a.f., input, high-impedance, 1715
    a.v.c., calculations, 1722
    c.r. tube, for power supply and control, 658
    cathode-follower, using screen-grid valves, 2349
    constant-current, 670
    coupled, attenuation, 1376
        transient state, 1377
        video-frequency, transient response, 671
    derivation of constants from oscillograms, 473
    diagrams, schematic, 1369
    electronic, industrial, fundamentals of, (B) 3490
    exciter, band-switched, 3469
    expansion, 2565
    frequency-changing, 648
    indicator, magic eye, 1255, (D) 2607
    inversion of autodyne principle, 3472
    mixing, for crystal and v.f.o. frequencies, 1704
    oscillatory, excited by interrupted d.c., 2039
    potentiometer, to produce tangent function, 161
    printed, on ceramics, 3164
        evolution of, 3080
        techniques, (A) 3079
    RC, with over-unity gain, 2702
    ratio detector, 3643
    reactance, 1391
    rectifier, 903
    shorthand symbols, 2930
    speech-clipping, theory and design, 3477
    squelch, design and application, 519, 520
    superheterodyne, tracking charts, 3830, tracking errors, 3967
    time measurement, 1710
    timing, pulse wave-front steepness, 1032
    tuned, band-spread, design, (D) 1195
        n-meshed, resonant frequencies of, 2352
        transient response, 1029
    valve (See also Valve circuits)
        for industrial control, 2521
        u.h.f., 368
    wave shaping, 1710
Climate, and deterioration of materials, 132
Cloud chamber, airborne, for cosmic-rays, (A) 1075
    applications, 79
Clouds, remote indication, 208
Coastal refraction See Direction finding
Coils, coaxial, for permeability tuning in f.m. band, 1718
    deflector, coupling distortion correction, 558
    dust ring-core, and applications, 1695
    for induction heating, 2876
    iron-cored, *Q* factor and effective permeability, 2372
    nonlinear, for pulse generators, 671, 1051
    solenoids, *Q* values, 1694, (D) 3046, (D) 3803
    toroidal, winding machine, 3672
    universal wound, inductance calculations, 367
    winding formulae, 2720
Communication (See also Aircraft communication; Broadcasting; Circuits; Light-beam communication; Reception; Transmission)
    channels, frequency bands for, 4026
    Q code and Russian equivalents, 2923
    radio, (B) 325
        application of ionospheric data, 2895
        1896–1946, survey, 1294
    signal ranges, v.h.f. and u.h.f., 2213
    theory, using information diagram, 1057, (A) 1729
    use of dm waves, 1939
— **engineering,** future problems, 3274
    maximum power transfer, 369
    progress at Brown Boveri works, 2233
— **equipment,** Army No. 10 set, 236
    directional, h.f., 1936, for military links, 1937
    in H.M.S. Boxer, 240
    in H.M.S. Vanguard, 2243
    marine, 4038
    mobile, f.m., 3665
    naval, 1940
    in S.S. Queen Elizabeth, 529
    train, American, u.h.f. aerial, 841
    transmitting, army, French, German and American, 564
    5-m, from existing equipment, 1935
    10000 Mc/s, 1931, (C) 2930
— **systems** (See also Broadcasting; Carrier-current systems; Infra-red; Radio links; Relay systems)
    a.f., train position indicator, 535
    airway, block signalling, 1091
    break-in operation, 1910
    colonial, (AD) 1209
    directional, 1938
    f.m., for forestry service, 4037, in French marshalling yard, 2578, for goods yard, 4036, mobile, 2936, on U.S. railways, 2247, 3664
    infra-red, (A) 3650
    microwave, between New York and Philadelphia, 2924
    in mines, effects of geological conditions, 2217
    mobile, police, in Australia, survey, 2246, for power-line servicemen, 883, R/T service, 4035, selective-calling, 3286, for taxicabs, 2579, v.h.f., a.m., 3276, 72 Mc/s, in mountainous area, 1590
    multichannel, directional, 1930, interference in, 241, (A) 1215, pulse, basic principles, 2235, u.h.f., relay, 2242, v.h.f., 234
    multiplex, pulse, 4031, using pulse-time modulation and pulsed f.m., (A) 3278, u.h.f., 1587, u.h.f. radio link, calculation, 1559, 2902, (D) 3629
    radio, future trends, (A) 4096, for South African railways, 2942, in Switzerland, 4098
    radio stations near Toulouse, 527
    radioteletype, for commercial aviation, 3655
    for railway signal operation, 537
    single-sideband carrier, 4027
    s.w., 1211, in Belgian Congo, war-time developments, 2925, calculations, 1210, (D) 3654
    in South Africa, 3651
    stratovision, (A) 1239, 3279, aircraft requirements, (A) 1239, 3280
    train, in U.S.A., 885, 1589, inductive system, 884; v.h.f., in tunnels, [illegible]
    v.h.f., in Potomac railway yard, 886, on Canadian Pacific coast, 2927
    for weather-report transmission, 536
    wide-band f.m., 3652
    2-channel, with single carrier, 1928
Compass, c.r., 3206; radio, 4-band, 3128
Components, British exhibition, 2722
    design trends, 1389
    for export, catalogue, (B) 2055
    French exhibition, 1052
    magnetic design factors, 365
    midget, 1724
    standardization, 978, 979
Conductivity, of gases excited by h.f. discharges, 1739
    of ground, measurement method, 3893
    of SiC, 745, mechanism, 1820
    of strong electrolytes, 712
    thermoelectric effect in PbS, 1821
Cones, asymmetrical vibrations, 1976
Conferences, conventions and exhibitions, Acoustical Society of America, 3748; British Commonwealth Scientific (1946), 2295, and official report, (D) 2636; British Industries Fair, 3744; C.C.I.F., Montreux (Oct. 1946), 3373, 4095; Chicago radio components show, 4101; components exhibition, Paris (1947), 2377, 2378, measurement apparatus, 2496; dielectrics conference, Bristol (1946), 2806; electron microscope conference, Oxford (1946), 3236; Electron Microscope Society of America, 1946 annual meeting, (A) 3237; electronic heating conference, 972; European air routes and radio facilities conference, 534; French components exhibition (1946), 1052; Glasgow technical exhibition, 1287; I.E.E. Radio-communication convention, 2644, 2647, 2648, 2649, 3377; I.E.E. radiolocation convention (1946), (A) 603; I.R.E. convention, 3359, 3742; International Union of Geodesy and Geophysics (1946), 2297; Marconi Jubilee exhibition, 4099; Moscow telecommunication conference, 871, 1581; Paris Fair (1946), measuring instruments, 1138; Paris Fair (1947), 4097; Physical Society exhibition, 2494, 3185, 3581; Radio Component Manufacturers' Federation exhibition, 2376, 2722, 3078; radio interference suppression conference, 1924; radio training equipment exhibition (1946), 319; research and the smaller firm, conference, 962; Rochester Fall Meeting (1946), 3299; Royal Society Empire Scientific conference (1946), 961; Second National Electronics conference (1946), abstracts of papers, 1291, proceedings, (B) 3381; Society of British Aircraft Constructors exhibition (1946), 421; Stockholm, British scientific instruments exhibition (1946), (A) 315; U.R.S.I. (1946), 596, 2758, 3376
Contact potential, measurement, 471
    metal-semiconductor, 1816, 1819
Contactors, survey, 1227
Contacts, electrical, materials, design and construction, (B) 781, 1111
        between metals, theory, 1069
    heavy-current, r.f., 2249, (A) 3671
Control (See also Amplidyne; Automatic control; Frequency control; Telecontrol)
    electrical, of position, 4004
    electronic, of a.c. motors, (A) 1154, 3213, 3985, of d.c. motors, 2198, 3210, 3212, 3985, handbook, (B) 2543, process, 2522
    industrial, valve circuits, 2521
    of missiles, 1171
    motor, constant-current system, 3210, 3211
    quality, of dielectrics, using h.f. currents, 179; in engineering, procedure, 2301; statistical methods, 966; of valves, 1963
    radio, of aircraft, 497, of model flying boats, 2888
    relay circuit, 3444
    remote, amplidyne system, 2584; continuously variable, 682; Magslip system, 2585, 2950; selsyn system, 2584; for navigation aids, 1454; progress at Brown Boveri Works, [illegible]
    speed, of induction motors, 3986
Converters (See also Frequency converters)
    for f.m. band receivers, 225
    ignitron, for induction heating, (A) 1154, 3222
Copper, and copper alloys, survey of progress, 1484; powder, electrolytic, German production methods, (A) 3942
Cores, dielectric baking of, 2517
    laminated, interlaminar resistance, 2170
    powdered iron, Ferrocart, 2816
        permeability, (D) 35, 1692, 1693, (D) 3163, (D) 3555, (D) 3838, [illegible]
        ring, 1695
        at v.h.f., 1119
Corona, detection in cables, 627, impulse, in air, (A) 3865, negative point, and Townsend coefficient, 3089, pulse, 2399, discharge paths, 2398
Corrosion (See also Weathering)
    of steel, prevention, 1110, processes, 3159
Cosmic noise (See also Noise)
    from galaxy, (A) 2758
    r.f., frequency variation, 1073, from Milky Way, 3511
    and solar noise, survey, 402, 1757
Cosmic rays (See also Mesons) (B) 83, (B) 2194
    abnormal increase July–Aug. 1946, 401; absorption and disintegration of mesons, 3885; absorption at 2100 m, 2413; Auger showers, (A) 2417, lateral extension, 2765; cascade component, power spectrum, 96; effects at high altitudes, (A) 424; electron component in lower atmosphere, 3886; energy spectrum, (A) 1434; experiments in V-2 rocket, 3512, (A) 3882; at great heights, 94; hard and soft components, ionizing power, 1436; high-energy protons, 719; highly ionizing particles, 1785, 2783; increases due to solar charged particles, 1438; intensity changes and geomagnetic storms, 721; intensity measurement, 3883; intensity at 3860 m and 5000 m, 3884; ionization bursts, 2766, (A) 3882, transition effects, 3890; meson latitude effect, (A) 3882; multiple production of neutrons, 1427; nuclear disintegrations at 11500 ft, (A) 3882; origin, 93; Pamir expedition, 2112; penetrating component in showers, 2784; phenomena, analysis, (A) 1437; production of nucleons, 3515, of penetrating ionizing particles, 95; proton hypothesis, 2107; relevance

to physical sciences, **3888**; research in aircraft, **3110**; showers, (A) **3882**, and bursts, **1439**, density spectrum, **2108**, **2109**, **3889**, fluctuations, **2113**, high-energy, (A) **3882**, nature, **2110**, origin and density spectrum, **2111**, penetrating, **1440**, penetrating, cloud chamber investigation, **1442**, penetrating, at 3860 m height, **1441**; photons, **1768**, theory, extension to low energy levels, **2416**, types, **1764**, at 11500 ft, (A) **3882**; slow mesons at sea-level, **3513**; soft component, (A) **1425**, at 3 km height, **1423**, **1763**; space correlation of particles, **1435**, **1766**; unusual particles, **722**; variations, with altitude, **1768**, on the Jungfraujoch, **2414**, zenithal, **2103**; at 1000 m height, heavy particles, **2100**; at 3250 m, **1443**

Counter circuits, current integrator, **1152**
  for G-M counters, **1364**
  pulse, recording, **1149**
    registering to arbitrary scale, **1878**

Counter technique, counting rate meter, **480**, **1150**
  statistical treatment, **1877**

Counters, with alcohol vapour, development of discharge, **2748**
  coincidence corrections, (A) **3978**
  diode coincidence circuit, (A) **3989**
  electronic, **2695**
    decimal, for time measurement, **2190**
  fast coincidence circuit with pulse height selection, (A) **3805**
  G-M, for β- and γ-rays, design, **484**
    characteristics in Neher-Harper circuit, **1871**
    counting rate meter, **1150**
    discharge propagation velocity, **3207**
    for high intensity measurements, **1876**
    with hollow anode, **1870**
    improved type, **1145**
    misses, formula, **1873**, theory, **1872**
    portable, **3977**
    self-quenching, discharge mechanism, (A) **3982**
    spread of discharge, **2865**
    for Th content determination, **751**, **820**
    various types, **1869**
  high-speed, **827**
  low-voltage, (A) **3980**
    self-quenching, (A) **3981**
  particle, simple type, **2866**
  photo-counter for pulse-excited amplifier, **2047**
  proportional, fluctuations, (A) **3979**
    for γ-rays, **1522**
  pulse, circuit, **2346**
  for random or uniformly spaced pulses, **3807**
  rapid, measurement of ion velocity, **2867**
    pulse shape, **2868**
  scale-of-N circuits, **3804**
  use of multiplier as counter for elementary particles, **2869**
  for waves and pulses, **1505**

Countermeasures, reflecting strip design theory, **1687**

Couplers, directional, for transmission lines, **2007**, for waveguides, **1007**

Coupling (See also Amplifier circuits)
  link, **3822**; receiver aerial, medium wave, **2010**; RC, **2353**

Crystals (See also Piezoelectricity; Quartz)
  carborundum, photo-effect, **1807**
  Ge-Ge contacts, (A) **2457**
  group velocity in lattice, **397**
  luminescence mechanism, **1812**
  magnetic properties of, **2075**
  quartz and topaz, surface layers, **754**
  rectifiers, noise measurement, **2569**
    noise spectrum, **2567**
  structure and thermal properties, **1748**
  structure, of titanates, **2805**
    of $MgWO_4$, **1462**
  surface hardening by polishing, **769**
  transformation of anatase into rutile, **138**

Crystallography, X-ray, for metal crystal structure, **753**

Currents, parallel, force between, **1745**

Cyclotrons (See also Electron accelerators; Ion accelerators; Particle accelerators)
  beam-current integrator and recorder, **1886**
  filaments, r.f. heating, **495**
  f.m., (A) **1162**, (A) **1163**, (A) **1164**
    and deflector problem, (A) **1161**
    University of California, **1885**, **2526**, **3234**
  mechanical f.m., **213**

D

Damping, of oscillations in X-ray transformers, **1225**

Degaussing, **841**, **843**
  correction of effects on ships' magnetic compasses, **844**
  electrical engineering aspect, **842**

Demodulation, pulse, theory, **2933**
  selective, **3059**

Detection, r.f., by superconductivity, **1915**, (A) **3853**

Detectors, crystal, for signal tracing, **2506**
  f.m., (A) **3060**, single stage, **227**, (A) **1188**, **3264**

Dictionaries, German-English, for engineers and physicists, (B) **4103**
  polyglot dictionary of science and technology, (B) **983**
  Russian-English, technical and chemical, (B) **3380**

Dielectric breakdown (See also Breakdown)
  in solids, theory of, **2405**

—— **constant,** frequency dependence in dipolar solids, **2743**
  of ground, measurement method, **3893**
  and loss, measurement at u.h.f., **177**
  measurement using waveguide, **2486**
  of non-polar liquids, measurement, **3187**
  of silicones, **761**
  of titanates, **2806**
  u.h.f. measurement, **3573**

—— **loss,** measurement at u.h.f., **178**

—— **properties** (See also Insulating materials and cross references)
  of $BaTiO_3$, **1108**, and of ferroelectric crystals, **1472**
  of butadiene-containing polymers and copolymers, (A) **3170**
  of ceramics, especially titanates, **759**
  of chlorinated polythenes, **2813**
  of high polymers, **2812**
  of ice, **2845**
  of low-loss solids at 25000 Mc/s, **2846**
  measurement at cm λ, **2843**
  of $NaClO_3$ and $NaBrO_3$, **752**, (A) **3925**
  of polystyrene at h.f., **763**
  representation of, **2843**
  of rubbers, **2815**, (A) **3167**
  of water, **2844**

—— **strength** (See also Breakdown)
  of paraffins and polymers, **764**
  of varnished cambric, **760**

Dielectrics, Bristol Conference, 1946, **2808**
  ceramic, low-loss, AlSiMag 243, **2460**
  comparison of Debye's and Onsager's theories, **2738**
  developments, (A) **314**, **440**, **1973**
  dipolar interaction, **2734**
  dipole orientation in solutions of esters in polyisobutene and polystyrene, **2814**
  distribution of relaxation times, **2799**
  entropy and energy changes in diffusion and relaxation processes, **2744**
  in industry, theory, **124**
  liquid, absorption of cm waves, **2840**
    dispersion and absorption of cm waves, **2730**
  mathematical representations of polar molecules in crystals, **2739**
  permeabilities and dipole moments, **3957**
  polar, liquid, polarization of, **2735**
    solid and liquid, theory of the crystalline field, **2736**
  relaxation of mixtures of dipolar liquids, **2742**
  solid, amorphous, power factor and temperature coefficient, **2798**
    electric breakdown, **2809**
    molecular freedom, **2740**
    power factor and temperature coefficient, **125**, **1476**, **3548**, **3572**, **3929**
  for telecommunication, **440**
  theory, **2741**, of internal electrical field, **2737**

Dies, diamond, manufacture by electrical methods, **3944**, uses, **774**

Differential analyser, **154**

—— **equations,** nonlinear systems, **3950**
  relaxation methods, **3565**
  use of phase integral methods, **3095**

Diffraction (See also Electromagnetic theory)
  of radio waves round the earth, **2891**
  of sound round circular disk, **1978**

Diffusion, from plane surface, **3494**

Dimensions, of electric and magnetic quantities, **696**

Diodes (See also Detectors; Valves, diode)
  emission-limited, **1266**
  with magnetic control of anode current, **1257**
  thermionic, theory, (A) **4074**

Direction finders, compensated-loop, (C) **2431**
  spaced-loop, for h.f., **2780**, (A) **3526**, for v.h.f., **2783**, (A) **3529**
  U-type, Adcock, use of earth mats, **2781**, (A) **3527**, use of earth screens, **2784**, (A) **3530**

—— **finding,** coastal effect, **2428**
  I.E.E. symposium, (A) **2126**
  lateral deviation at sunrise, **2125**
  m.f., radiogoniometer for, **2127**, (A) **3133**
  microwave, angle of arrival, **1182**, **1183**, (A) **4009**
  point location by cross bearings, **103**
  portable 1.7-Mc/s-band receiver, **2778**
  s.w., site and path errors, **2782**, (A) **3528**
  u.h.f., **1087**
  on λ 1.67 m, **732**

Discharge (See also Arc discharge; Corona; Spark discharge)
  arc, hot-cathode, oscillations, **1406**, and noise, effects of magnetic field, **2400**
  electrical, through gases, **3854**
    low-pressure, **2749**
  electrodeless, **2019**
  gaseous, h.f., and conductivity, **1739**, effect of applied magnetic field, **715**, energy distribution of electrons, **1407**
    high-pressure, **3500**
    ignition time constant, **2287**
    pre-corona, use as reference potential, **1596**
    r.f., effect of d.c. potential, **2397**, **3856**

—— **lamps,** electric, (B) **906**

—— **tubes** (See also Switches, t.r.; Thyratrons)
  analysis of intermittent discharge, **940**
  current maximum for intermittent functioning, **941**
  gas, cathode sputtering, **592**
    magnetically controlled, **591**
  gas-filled, impedance, **1632**
  induction effect on current in surrounding coil, **3093**
  ion beams in h.v. tubes, **2627**

Dispersion, of optical glasses in near infra-red, **2060**

Distortion, analyser, **2499**
  current, due to nonlinear impedance, **185**
  in diode detectors, **2366**
  even-harmonic, cancellation in push-pull operation, **2719**
  f.m., due to interference, **3266**
  of f.m. signals, by band-pass filters, **1698**
  harmonic, graphical calculator for, **2026**
  network, (A) **3451**
  nonlinear, in class-B amplifiers, **4019**
  pulse, due to interchannel interference, **230**, (A) **1198**
  telegraph, c.r. measuring set, **3192**

Documentation, in engineering, **963**
  microfilm, new apparatus, **964**

Donutron (See also Magnetrons, squirrel-cage)
  tunable squirrel-cage magnetron, **2987**

Drafting, for electronics, (B) **2724**

Drawing aids, for electrical diagrams, **1296**

Dynatrons, operating conditions and equivalent circuit, **36**

E

Earphones, midget, military development, **347**

Earth, electric field measurement, using potential of conductor, **1081**

Earthing, of electrical installations, **3934**

Eddy currents (See also Ferromagnetism)
  and hysteresis, energy dissipation relation, **703**
  loss in transformer cores, theory, **2343**

Elasticity, properties of $NaClO_3$ and $NaBrO_3$, **752**, (A) **3925**

Electrical applications, measurement of mechanical quantities, **824**

—— **communication,** developments, **1276**

—— **properties,** of materials, black body method of investigation, **2059**

Electricity, in building industry, (B) **1298**

Electroforming, in precision work, **2150**, survey, **1478**, **2462**

Electrolysis, mechanism, energy transfer coefficients, **713**

Electrolytes (See also Salt solution)
  strong, conductivity of, **712**

Electrolytic detection, of lead in brass or zinc, **142**

Electromagnetic field, of dipole on two-layer earth, **3435**, (D) **3436**
  h.f., measurement, **2487**
  magnetic and electric stresses, **396**
  of multipoles, **3863**
  of plane wave, near conducting body, **2081**
  plotting methods, (A) **630**
  quantum mechanics, **687**
  quantum theory, **2384**
  variations, recorders for, **2251**

—— **theory** (See also Diffraction; Mathematics)
  application of Riesz potential, **1411**
  currents induced by plane wave on surface of conductor, **1412**
  diffraction, by convex body, approximate solution, **2081**
    at screens with slit apertures, **2080**
    at surface of separation of two media, **2078**, **2079**
  discoverer of Biot-Savart law, **1065**
  and electrons, **3496**
  elementary survey, **313**
  energy of isolated system, **3862**
  generalized boundary conditions, (A) **1059**, **3094**
  Huyghens' principle, **845**
  impedance of sphere in magnetic field, **366**
  Maxwell's equations, and dynamics of the aether, **691**
    matrix form, **3491**
    mechanical explanation, **690**
    symmetrical form, **704**
  propagation and diffraction in successive media, **1413**
  radiation through aperture in resonator, **375**
  and uniformly accelerated motions, **3843**
  wave equation solution for resonant cavities, **52**, (A) **1028**

Electromagnetism, experimental basis, **3091**, (D) **3092**
  use of analogies in teaching theory of, **970**

Electromechanical systems, violation of reciprocity theorem, **370**

Electron acceleration, by single cavity, (A) **3998**

—— **accelerators** (See also Particle accelerators and particular types)
  application of resonant cavities, **1708**
  cavity, **3999**
  development and applications, **1539**
  and electron mass, **1735**
  electron radiation in, (A) **1538**
  induction, European, **2527**
  microwave, Purdue, (A) **1540**
  [illegible], (A) **3998**
  resonance types, (A) **1537**
  survey, **3608**
  for 2–6 MV, (A) **1154**, **3235**

—— **beams,** **2706**, (D) **3824**
  bunching, effect of space charge, **75**, (A) **1258**
  cathode design, **4071**
  deflection, e.s., (A) **1608**, in valves, **336**
  dispersion at high vacuum, **3849**
  energy exchange with weak magnetic field, **2969**
  focusing, magnetic field for, **1868**
  interruption of, **2020**
  production in low-voltage tubes, **1629**
  rectangular-section, bunching in, **1627**

—— **diffraction,** applications, **3597**
    to h.v. measurement, **2169**
  by electrolytically polished Cu, **768**
  by free molecules, (B) **1749**
  relative intensities, **1867**
  use for measurement of high d.c. voltages, **791**
  use for studying insulating materials, **757**

—— **emission,** from Al_2O_3, (A) **433**
  cold, from plane metal surfaces, **1741**
  from oxide cathode, **573**
  Richardson's equation and oxide cathodes, (A) **3859**
  secondary, application to multiplier tubes, **2279**; from Ge, B, and Si, **746**; from metallic oxides, and data for electronic apparatus, **572**; from oxide cathodes, (A) **282**; rediffusion, **2750**; from solid bodies, **570**; surface charge due to, **580**; from thin dielectric films, effect of electric field, **571**
  from semiconducting cathodes, **1962**
  thermal, from C, Si and SiC, **2801**
  from W-Cs and W-Th cathodes, **1265**

—— **flow,** in conductors, probability of, **2746**

—— **guns,** high-current, **1967**, (A) **4076**
  in television apparatus, **1968**

—— **images,** observation of, **2187**

—— **microscope,** (B) **1174**, (B) **1897**, (A) **2529**
  bibliography, **1546**
  design, **3612**
  as diffraction camera, **1169**
  electron diffraction studies, **395**
  e.s., **3611**, C.S.F., **1166**, **1167**
  lens aberration reduction, (A) **1168**
  limits of sensitivity, **1545**, **1866**
  magnetic, objective asymmetry, **2530**
  present status and future possibilities, **3610**
  replicas, silica, preparation, **3615**, shadow-cast, **2201**, technique, **3239**
  resolution, committee report, **1889**, of e.s. objective, **4003**, limit of, **3238**, **3613**, **3614**
  shielding, **2753**
  theory and operation, and applications, **496**

—— **motion,** in conductor, diamagnetism and superconductivity, **71**
  in crossed electric and magnetic fields, **1626**
  in electric field, graphical determination, **697**
  through ferromagnets, (A) **1064**
  force between electrons in parallel paths, **1066**
  in h.f. apparatus, **579**
  in magnetic field, (A) **706**, **1257**
  reaction of e.m. field, **1404**
  in valves, induction currents, **1269**

—— **multipliers,** application of secondary emission, **2279**
  development and characteristics, **578**
  microwave, (A) **3976**
  requirements for, **577**

—— **optics,** astigmatism and focal surfaces, **4002**
  of deflection fields, (A) **1154**, **3346**
  and electron microscope, (B) **1174**
  of electron multiplier, **569**
  instrumental shape imperfections, **1521**
  introduction to, (B) **1173**
  of system emitting slow electrons, **568**

—— **theory,** Dirac, densities of mean values, **1394**

—— **waves,** polarization, **2385**

Electronic applications, (A) **1532**; a.c. motor speed control, (A) **1154**, **3213**; aircraft communication, **1455**; in atomic bomb tests, **1892**; automatic key, **255**; at Caterpillar Tractor works, **2197**; colour matching, **1535**; constant-current motor control, **3210**, **3211**; contouring control, **207**, (A) **1154**, **3227**; coreless induction furnaces, (A) **3223**; d.c. motor drives, (A) **1154**, **3209**; in engineering, **492**, **2880**; furnace temperature measurement, **826**; geologic mapping equipment, **3601**; industrial, (AD) **1531**, (A) **1881**, (A) **2523**, **2879**, bibliography, **2520**, **3607**, **3992**; in measurement, **1882**; metal detectors, **214**, (A) **1154**, **3244**; meteorology, **3119**; microwaves for cooking, **838**; multicolour printing, (D) **3228**; precision grinding machines, **493**; pressure measurement, **1553**; punch press protector, **1159**; register control in printing, **3606**; remote cloud indicator, **208**; speed regulation of steam turbine, **1148**, (D) **3193**; in submarine warfare, **3537**; use of microwaves, **209**; welding, **3991**

—— **devices,** glossary of 'trons', **2302**; power supply applications, **487**

Electronics, economics of, **318**; future problems, **3274**, **3371**; introduction to, (B) **605**; in measurement, **3994**; microwave, **2668**; and nucleonics, **3745**; postwar developments, survey, **601**; survey, **3993**

Electrons, atoms and the engineer, **3367**
  cascade, energy spectrum, **1426**
  characteristics, survey, **1734**
  charge, determination by oil-drop method, **1402**
  classical equations of motion, **72**
  conductivity in gas at u.h.f., (A) **76**
  energy and stability in electric fields, **2391**
  high-energy, detector for, **2394**
  motional mass of, new theory, **1735**
  non-primary cosmic-ray, above earth's atmosphere, **2762**
  photographic action, mechanism, **2070**
  secondary, absorption by thin screens, **1742**
    depth of generation in metals, **2404**
    velocity distribution, **2403**
  self-energy of, **1401**

Electroplating, Cd, humidity tests, **778**, **779**, **1485**, (D) **2157**
  Cu, **448**
  identification of coatings, **434**

Encephalophone, simplified, **2350**

Energy, apparent, definition and measurement, **1507**

Engineering, electrical, principles, (B) **4104**, progress, (A) **3370**, rudiments, (B) **2653**
  electronic, (A) **3372**, handbook, (B) **2544**
  in f.m. broadcasting stations, **542**
  nuclear power-plant, (A) **1154**, **3208**
  progress in 1946, **2996**

Engines, internal-combustion, knock measurement amplifier, **1551**

Epidiascope, for pre-television, **909**

Equalizers, constant-impedance, design, **664**
  three-band variable, **1316**

Equations, integral, of Fredholm and Volterra, numerical solution, **786**
  linear simultaneous, computer for solution of, [illegible]
    solution by escalator process, **463**, (B) **2167**

Equivalent circuits, for amplifier valve noise, (A) [illegible]
  for cavity resonators, (A) **1036**
  for piezoelectric crystals, **482**
  for thermal systems, existence of thermal inductance, **70**
  valve, **949**, **1966**, (D) **2622**, (D) **2623**, (D) **3721**
  for waveguide with plane discontinuity, **634**

—— **generator,** valve, **2380**

Escalator process, for simultaneous equations, **463**; for Lagrangian frequency equations and vibration problems, (B) **2167**

Exhibitions See Conferences, conventions and exhibitions

F

- **Facsimile,** applications to police work, finger print transmission, **498**
  - commercial applications, **2951**
  - developments, **(A) 3678**
  - equipment, Cable & Wireless, **2259**
    - news-service, **2258**
    - in H.M.S. Vanguard, **2260**
  - history and development, **2257**
  - of text and photographs, **262, 265**
- **Fading** (See also Field strength ; Ionosphere ; Wave propagation)
  - interference, u.h.f., elimination, **229**
  - s.w., on 700-km path, **853**
  - v.h.f., effect of aircraft reflections, **850, 923**
- **Feedback** (See also Amplifiers, feedback)
  - negative, in cascade amplifiers, graphical analysis, **371**
    - for improved amplifier performance, **372**
- **Ferroelectric salts,** and Curie point, **128**
- **Ferromagnetic materials** (See also Alloys ; Magnetic materials)
  - anomalous h.f. resistance, **747**
  - elastic and magnetic after-effects, **1823**
  - electron motion through, **(A) 1064**
  - fine-grain powders, **3151, 3152**
  - properties, of Fe_4N, **131,** of $MnNi_3$ and Fe_3C, **2138,** in weak a.c. fields, **797**
- **Ferromagnetism,** domain theory of structure in films and small particles, **2072**
  - eddy currents in thin disk, **650**
  - exchange interaction of valence and inner electrons, **2074**
  - properties of crystals, **2075**
  - saturation, and neutron polarization, **2076**
  - at v.h.f., **3182, (A) 3183**
- **Field,** electric, plotting, for magnetron, **3560**
    - in rectangular conductor, **73**
  - e.s., plotting, **446,** with adapted electrode shape, **1495**
- —— **strength,** measurement, apparatus for 200–7000 kc/s, **2836**
    - on television link, **552**
    - u.h.f., circuit components for, **819**
    - at 45.5 and 91 Mc/s, beyond horizon, **2214**
  - meter, 88–400 Mc/s, **3582**
  - range data, for broadcasting stations, **1934,** for radar set, **2130**
  - ranges, u.h.f. and v.h.f., and interference, **2213**
- **Films** (See also Sound films)
  - insulating, **(D) 140**
  - photographic, in television process, **913**
    - for television monitor tube photography, **907**
  - thin, metallic, on glass, structure, **435,** production by vaporization, **1414**
    - optical, anti-reflection and high-reflection, **711**
    - thickness measurement, **967**
- **Filters** (See also Networks ; Quadripoles)
  - a.f. and h.f., survey, **1024**
  - attenuation constant formula, **661**
  - band-pass, extension of Norton's method, **3818**
    - narrow, using modulation, **2697**
    - RC, a.f., **2053,** design, **3076**
    - triple resonant, **46**
  - band-pass effect, at h.f., **1720,** in crystal resonators, **1721**
  - crystal, **2701,** properties and construction, **1696**
  - dependence of intensities on Tchebycheff polynomials, **652**
  - design and prediction, Wiener r.m.s. error criterion, **1372**
  - design tables, **3819**
  - double-derived terminations, **47**
  - electric, **(B) 2382**
    - and crystal lattices, propagation in, **(B) 1907**
  - electromechanical, **3075**
  - for guided waves, **1673**
  - incidental dissipation in, **49**
  - insertion characteristics, **1697**
  - ladder-type, calculation, **1023**
    - conditions for common frequencies, **2028**
  - optical and infra-red, plastic, **3541**
  - RC, for gramophone amplifiers, **3839**
  - rejector, generalization, **1371**
  - resonant, design, **3074**
  - theory and design, **3817**
  - transient response, **48, (D) 662, (D) 2035, (D) 2348**
  - tuned a.f., design, **3486, 3840**
  - Zobel, multi-section, insertion loss and insertion phase shift, **2696**
- **Flaw detection** (See also Supersonic applications ; X-ray applications)
  - betatron for, **2206**
  - in copper by electrolytic polishing and immersion, **437**
  - supersonic, **986**
    - principle and method, **2184**
  - X-ray methods, **1548**
- **Fleming, Ambrose,** life and early researches, **1282**
- **Fluctuation** (See also Random fluctuation)
  - spontaneous, statistical analysis, **4089,** in valves, **4088**
  - voltage, recording of, **792**
- **Fluorescence** (See also Luminescence ; Phosphorescence)
  - of solutions, **2592**
  - fatigue, **432**
  - of $MgWO_4$, **1105**
  - of ZnS irradiated by α rays, **1106**
- **Fluorescent lighting,** dimming of, **317**
- **de Forest, Lee,** survey of papers, **2998**
- **Fourier analysis,** of sawtooth f.m. oscillations, **784**
- —— **transform analysis, 2351**
- **Frequency** allocation, amateur bands, **2575,** British, **3692,** Moscow conference, **871,** for c.w. and phone, **1580,** 10-m, **872**
    - for British and American forces, **881**
    - broadcasting, European, **242**
    - F.C.C., **3653**
  - analyser, c.r., **1850**
    - l.f., electronic, **794**
    - for ocean waves, **203**
  - bands, proposed decade system of designation, **3378**
  - classification, **2650**
  - compression and expansion, **1057, (A) 1729**
  - control, in h.f. generators, **(A) 1154**
    - in television receivers, **2599**
  - converters (See also Converters, frequency)
    - electronic, for aircraft, **3039**
    - f.m., 12-channel, **1187**
    - gain and sensitivity for m and dm waves, **3067**
    - superregenerative, **2563**
  - discriminators, crystal, for f.m., **2713**
    - theory, **1384**
  - division, by LC oscillator, **817**
  - doubler, using Radiotron Type 807, **4084**
  - measurement, F.C.C. techniques, **3577**
    - short-period comparisons, **2178**
  - meters, **2346, 2503**
    - cavity resonators at cm λ, **3187**
    - electronic, **1148, (D) 3193**
    - heterodyne, 450–10000 Mc/s, **3194**
    - for pulse recurrence frequencies, **480**
    - for quartz crystal frequencies, **812**
    - use as v.f.o., **2270**
    - v.h.f., [illegible]
    - 100 kc/s–50 Mc/s, **2179**
    - 600 c/s–100 Mc/s, **2504, (A) 2856**
  - modulation See Modulation, frequency
  - stability, u.h.f., **(A) 1139, 3321**
  - stabilization, electronic, of microwave oscillators, **1690**
    - in f.m. transmitters, **1614**
    - theory, **363**
    - in v.h.f. receivers, [illegible]
  - standards (See also Standard frequency)
    - and applications, **(A) 186, (D) 1143**
    - secondary, with 500-kc/s quartz crystal, **1144**
    - 100-kc/s, for receivers, **2180**
- **Fuses,** electronic magnetic, for mines, **201**
  - proximity, **1555, 2541,** development, **3619,** optical, **2540**

G

- **Galaxy,** magnetic field, **1422**
- **Galvanometers,** mirror, high-sensitivity, **2175**
- **Gauges** (See also Vacuum technique ; Ionization gauges)
  - electric, in quality control, **3216**
- **Generators,** h.v., e.s., **4041, 4042, 4043, 4044**
  - linear-sweep, sawtooth, **902**
  - pulse, for standardizing atmospheric recorders, **3471**
- **Geomagnetic activity,** periodicity, **1771**
  - and solar faculae, **92**
  - of 28th March 1946, **725**
- —— **disturbances,** and solar corona, **3117**
- —— **exploration,** in U.S.S.R. with airborne equipment, **410**
- —— **storms** (See also Solar activity)
  - and cosmic-ray intensity, **721**
  - monitor for, **723**
  - in polar regions, **412**
  - and solar activity, in 1945, **90,** in 1946, **1754**
  - of 16th–23rd Sept. 1946, **1772,** Jan.–March 1947, **3898**
- **Geomagnetism** (See also Ionosphere ; Solar activity)
  - in ancient France, **724**
  - C and K indices, July–Sept. 1946, **1770,** Oct.–Dec. 1946 and summary for 1946, **3116**
  - data for July–Sept. 1946, **1755,** data for Oct.–Dec. 1946, **3102**
  - declination variations, and solar activity, **2089, 2090**
  - diurnal variation, and disturbances, **3897,** and ionospheric currents, **3896,** ionospheric influence, **729**
  - earth's field in S. Africa, July 1930, **2768**
  - and F_2 region of ionosphere, **728**
  - history, **411**
  - induction effects, secular variation, **98**
  - international magnetic character figures C for 1884–1889, **3113**
  - magnetic elements, Christchurch, N.Z., 1945, **3894**
  - mean K-indices for 1945, **3114**
  - origin, theory, **99, 1444**
  - position of north pole, **1076**
  - quiet and disturbed days, Jan. Mar. 1946, **1769,** April–June 1946, **3115,** July–Dec. 1946, **3895**
  - theoretical interpretation, **2115**
  - 100 years observations at Tiflis, **2767**
- **Geophysics,** work of Department of Terrestrial Magnetism, **1751**
- **Germanium,** Hall effect and magnetoresistance, **(A) 3157, (A) 2452**
- **Glass,** developments, **450**
  - dielectric properties at u.h.f., **452, (A) 1114**
  - electrical fusion, **775**
  - for lamps and radio valves, **144**
  - luminescence, survey, **1813**
  - manipulation techniques, **782**
  - metallization, **1480**
  - optical, dispersion in near infra-red, **2060**
  - power loss variation with frequency, **1113**
  - sealing, **1467**
  - ultraviolet-transmitting, **3556**
  - viscosity and heat effects, **776**
- —— **blowing,** for scientific purposes, technique, **451**
- —— **technology, 2819,** h.f. heating in, **1156**
- **Glazing,** automatic machine for, **777**
- **Glossary,** of radio terms, **2652**
- **Glow discharge tubes,** for measurement, **191**
- **Gramophone,** groove recording, light-pattern method, **1985**
  - needles, standardization, **615**
  - recording styli, effect of shape, **616**
  - records, noise suppression, **991**
- **Greenwich Observatory,** history and functions, **1284**

H

- **Hall effect** in Bi-Sb alloys, **3873**
- **Hardening,** of steel, induction machine for, **204**
- **Harmonic analysis** See Fourier analysis ; Waveform analysis
- —— **frequencies,** identification of, **2491**
- **Harmonics,** suppression of, **934**
- **Headphones,** measurements and performance, **1991**
- **Hearing,** analysis, efficiency and mechanism of ear, **1057, (A) 1729, (A) 3003**
  - tests, pulse tone technique, **3761**
  - threshold, **614,** of short tones, **3762**
- —— **aids,** miniature, **3775**
- **Heat** conduction, in elliptical cylinder, **(C) 3493**
  - treatment, of highly conducting bodies, by h.f. eddy currents, **2515**
- **Heating,** constant-temperature, temperature charts, **3605**
  - dielectric, **3224** ; for core baking, **2517** ; h.f., **2877** ; industrial applications, **2874** ; microwave, **2518** ; for plastics, **(A) 1154, 2196, 3225** ; survey of principles and methods, **(A) 1880** ; in textile industry, **491** ; theory and practical limitations, **2194**
  - of ferromagnetic materials by eddy currents and hysteresis, [illegible]
  - h.f., **828, 2516** ; applications to vulcanization, drying, case-hardening, **1879** ; frequency constancy, **(A) 1154, 3221** ; for glass working, **1156**
  - induction, applications, **1529, 2195** ; coil design, **2876** ; and dielectric, **2514** ; duplex operation, **829** ; effect of frequency, **205** ; flexible cable for, **1001** ; h.f., **(B) 217,** survey, **(A) 1530** ; industrial applications, **2874** ; machine for steel hardening, **204** ; for soft soldering, **1554** ; temperature charts, **3605**
  - by microwaves, **(A) 1154, 3226**
  - r.f., conference, **972** ; for cyclotron filaments, **495** ; grid-controlled rectifiers for, **199** ; use of magnetron, **2193**
- **High voltage** (See also Corona ; Breakdown)
  - d.c., measurement by electron diffraction, **791**
  - electronic devices for protection, **487**
  - measurement, **(A) 472, (A) 1132,** by c.r. tube, **3178,** spark-gap calibration, **3585**
- **Hodoscope,** for trajectory of charged particle in magnetic field, **2082**
- **Hum,** in high-gain a.f. amplifiers, **1689**
- **Humidity** (See also Atmosphere ; Climate ; Moisture ; Tropicalization)
  - effect of mould on radio equipment, **1826**
  - measurement in air and gases, **429**
- **Hydrophones,** conditions affecting front-to-back discrimination, **(A) 2307**
  - German systems, **3758**
  - reciprocity calibration, **3768**
- **Hypotheses,** and false preconceived ideas, **1662**
- **Hysteresis,** and eddy currents, energy dissipation relation, **703**

I

- **Ignitors,** resistance, characteristics, **2945**
- **Ignitrons,** operation and working characteristics, **574**
- **Impedance** (See also Acoustics ; Aerials ; Charts ; Circle diagrams ; Transmission lines)
  - acoustic, of enclosures, **3749**
    - measurement, **3402**
  - calculation by matrix methods, survey, **1329**
  - of gas-filled tubes in h.f. discharge, **1682**
  - matching, aerial tuner for, **14**
    - circuits for rhombic aerials, **1678**
    - for ground-plane aerials, **3024**
    - of tapered transmission lines, **1331**
  - measurement, of cables at u.h.f., **175**
    - of coaxial cables, **1848**
    - of cylindrical dipoles, **1338**
    - for dm waves, **1862**
    - h.f. bridge, **3960**
    - with non-tuned Lecher system, **2171**
    - r.f., bridge null indicator, **1516** ; equal ratio bridge for, **806**
    - on transmission lines, **2673**
    - at [illegible]
    - Z meter, **1142**
  - mutual, of half-wave dipoles, **23, 2013**
  - negative, measurement with Q-meter, **1849**
  - network, reflection-coefficient meter, **18**
  - nonlinear, current distortion measurement, **185**
  - plotting device for microwaves, **3571**
  - of sphere in magnetic field, **366**
  - tensor calculations, **2033, 3820**
  - transfer, for π and T networks, **657**
- **Indication,** remote (See also Telemetry)
  - Magslip system, **2585, 2950**
- **Inductance,** calculation, **(B) 683,** methods and formulae, **(B) 1055**
  - in elliptical cylinder, **(C) 3493**
  - ferromagnetic, theory, **2021**
  - measurement by grid-dip oscillator, **2177**
  - mutual, of concentric coils, abac, **651**
  - standards, comparison by Maxwell-Wien bridge, **793,** national, comparison, **1129**
  - of wires and tubes, formulae, **1017, (A) 3041**
- **Industry,** electrical, French, and S.F.E., **1288** ; progress, work of E.R.A., **1277** ; use of Al and Mg, **1233**
  - German, reports on, **598**
  - metallurgical and electronic products for, **995**
  - radio, economics, **1293**
- **Infra-red** absorption spectra of glasses, **3540**
  - applications, to heat treatment, drying and baking, **2878** ; military, **(A) 1154, 2861, 2862, 3231, 3595** ; night vision, **2207**
  - communication, using Cs vapour lamp, **1204,** components, **1230**
  - detection, radioactive detector, **198**
  - equipment, Cs vapour lamps, **3596**
  - heating, gas-burner for, **2519**
  - image tube, **2861**
  - radiation, Se filters, spectral characteristics, **2640**
  - signalling, bolometer for detection, **1527** ; modulation methods, **(A) 1154, 3241**
  - technique, German, **210**
- **Instruction and training,** advanced practical mathematics, **1490** ; demonstration oscillator, **3063** ; for electronics industry, **601** ; E.R.A. apprenticeships, **2299** ; I.E.E. and education grants, **2298** ; methods for electricity and magnetism, **1285** ; post-graduate, in electrical engineering, **(A) 314, (D) 600, 1978** ; radio and radar in R.A.F., **319** ; technical requirements of radio industry, **4090**
- **Instruments,** illumination of dials, **151**
  - measuring (See also Meters)
    - developments, **181**
    - electrical, manufacture in India, **1508**
    - feeder reflectometer for s.w.r., **3801**
    - h.f. generator, Q meter, **1850**
    - h.v., **1859**
    - luminous spot, scanning device, **798**
    - microwave, **799**
    - at Paris Fair, **1138**
    - pointer indication, **1511**
    - pressuregraph, **(A) 1154, 3214**
    - and recording, electronic, **(A) 2248**
  - scientific, British development, **(A) 315**
- **Insulating materials** (See also Ceramics ; Dielectrics : Glass ; Mica ; Paper ; Plastics ; Polymers ; Polythene ; Rubber ; Silicones ; Tetrafluorethylene ; Varnishes)
  - artificial, current creep, **3932**
  - Ba-Sr titanates, **3551**
  - $BaTiO_3$, **1473,** Curie point, **3930,** dielectric properties, **3547,** effect of temperature on permittivity, **2459**
  - cellulose, effect of semiconducting liquids, **2458**
  - examination by electron diffraction, **757**
  - film-forming, **(D) 140**
  - mineral, for cables, **12, (A) 629**
  - oils, dielectric loss, **443, (D) 3160**
  - organic, flashpoint, **441** ; layered, dielectric and mechanical properties, **1474**
  - plates for receiver construction, **1913, (A) 2555, 2556, (A) 2909**
  - in radio engineering, **(AD) 2144**
  - steatite, **2811**
  - various, properties, **2474**
  - varnished cambric, breakdown strength, **760**
  - varnished cloths, **(B) 152**
- **Insulation,** h.f., steatite for, **139**
  - for h.v. pulse networks, **1477**
- **Insulators,** for aerial reflector systems, **357**
  - porcelain, at high altitudes, **442**
  - toughened glass, manufacture, **3933**
- **Interference,** in amateur bands, reduction by staggering allocations to c.w. and phone, **2941**
  - and channel frequency assignments, **241, (A) 1215**
  - from electrical appliances, **2922**
  - from fluorescent lamps, **(A) 2231, 2571**
  - impulsive, prevention, **3648**
  - from industrial electronic apparatus, **(AD) 2230**
  - Luxemburg effect, **513**
  - from meteorological installations, **1925**
  - reduction with beam aerial, **4021**
  - from r.f. heating equipment, **4020**
  - suppression, international conference, **1924**
  - in v.h.f. communication, **(A) 1188, (A) 3267**
- **Interpolation,** by first differences, **153**
- **Ion accelerators, 3608**
- —— **motion,** in electric field in gas, **1405, 2064**
- **Ionization,** of air, by ultraviolet light, **(A) 3856**
  - currents, in non-uniform electric fields, **1408**
  - of gases, energy release in, **2071**
    - h.f. energy in magnetic field, **2406**
  - due to meteors, **3874**
  - sporadic E, **3874**
- —— **gauges** (See also Vacuum technique)
  - design, **3916** ; radioactive, **117**
- **Ionosphere** (See also Atmosphere, upper ; Meteors ; Solar eclipse ; Solar radiation ; Wave propagation, e.m.)
  - basic properties and processes, **414**
  - changes of phase-paths of reflected waves, **2114**
  - clouds, **(A) 3518**
  - correlation with sunspot activity, survey, **2117**
  - D-layer echoes in Pacific, **3122**
  - data, application to radio communication problems, **2895**
  - diffusion of ions, **415**
  - discussion on, **(D) 3120**
  - E layer, density, **3903** ; density and sunspots, **1677** ; origin, **1776**
  - E and F layers, nocturnal variations in height, **727**
  - early history, **1775**
  - effect of solar eclipse, **2411, 2412**
  - E region, geomagnetic control, **728,** solar tides in, **2421**
  - history and mechanism, **1779**
  - influence on geomagnetic field, **729**
  - interaction of radio waves, **513**
  - investigations, survey, **3519**
  - ionization, mechanism, **416, 1446** ; by meteors, **2408**
  - layers, formation, **(A) 2758**
  - low altitude echoes, **1774**
  - oblique radio transmission and Lorentz polarization term, **2896**
  - propagation forecasts, m.u.f., **221,** [illegible]
  - and radio communication, **220**
  - recombination coefficient at solar eclipse, 20th May 1947, [illegible]
  - recording equipment, **(A) 3517** ; for field use, [illegible] ; at

Johannesburg, **3121**
and solar eclipse, of 1943/44, effects on F_2 layer, **502** ; Jan. 1944 at Huancayo, **503** ; 9th July 1945 in Sweden, **1777**, **1778**
soundings at Bagneux, April–June 1946, **726**
sporadic-E layer, **2770**, ionization at Watheroo, **1445**
structure, (B) **420**
sunspots and solar corona, (A) **3127**
survey, and effects on wave propagation, **1447**, (D) **3520**
temperature, **3123**, and radiative equilibrium, **2422**
true height of layer, **3902**
work of Ionosphere Bureau, **2419**
Ions, mobility and diffusion of, **702**
positive, interaction with metallic surfaces, **744**
Iron oxides, magnetic dispersion at cm λ, **748**
Irreversible processes, Onsager's theory, **65**

K

Kenotrons, cold-cathode, **581**
Key, morse, automatic, electroplex, **1699**
Keying, automatic, electronic, **255**
frequency-shift, **275**
monitors for, **1864**
on-off and frequency-shift, comparison, **3702**
Klystrons (See also Valves, v.m.)
as amplifiers at cm λ, **3355**
with external cavity, **4082**
high-power, using Hartley circuit, **4083**
noise suppression, **3481**
operation, **1271**
power and efficiency, practical limitations, **2992**
reflex, oscillators, maximum efficiency, (A) **588**, **2993**
self-excitation, **3740**
theory, **587**
single-circuit, theory, **1647**, **3739**
theory, **4081**, of monotron, **956**
two-cavity, power and efficiency, **2991**
water-jet analogue, **1648**

L

Laboratories, for metallurgical research, **146** ; mobile, requirements for railways, **470** ; National Physical, associations with industry, **1654**, survey of work, **309** ; National Physical, of India, **2638** ; National Research, of India, **2639** ; research institute, central glass and ceramic, India, **3360**
Lamps, arc, Cs-vapour, infra-red, **900**, **1204**
concentrated-arc, beam modulation, **3691**
incandescent, in nonlinear bridge circuits, **45**
Lenses, acoustic, for underwater sound, (A) **2307**
e.s., aberration due to ellipticity, **2531** ; disturbing potential due to ellipticity, **2202** ; electron trajectories, **3065** ; first-order elements, **835** ; properties, **1544**
ultrasonic, measurement and specification, **3391**
Light (See also Reflection ; Wave propagation)
corpuscular theory, **1058**, **1398**
Light-beam communication, infra-red, components, **1230**
short range, **2234**
for television, **1604**
Lightning, imprinting of images by, **1450**
nature of discharge, **1784**
protection, of broadcasting systems, **879**, on h.v. lines, (A)**1947**, of transmission lines, **625**
selective attraction, **896**
warning device, **3987**
Limiters, nonlinear, **2691**
Lines, overhead, surge waves and oscillations, **3777**, surge wave theory, **3776**
transmission See Transmission lines
Literature, technical, German, photostat service, **4091**
preparation of papers, **308**
Rutherford papers in Cavendish Laboratory, **1278**
scientific and industrial reports, U.S. weekly bibliography, **3361**
Location, of thunderstorm centres, **3132**
Loudspeakers, duo-cone, developments, **993**, **2664**
electrodynamic, acoustic problems, **1310**
feed circuits, **3770**
report of French commission, **1311**
test equipment, **1312**
transient response, **1313**
vibrations, stroboscopic study, **617**
15-W, for naval use, **2318**
Luminescence, of crystalline substances, mechanism, **1812**
decay in ZnS phosphors, **2135**
extinguishing in complex molecules, **1809**
of glasses, survey, **1813**
of Mn-activated phosphors, **1806**
mechanism, in phosphors, **1817**, **2136**, in semiconductors, **1810**
radar applications, **2796**
of rare-earth salts, **1811**
thermoluminescence of ZnS, **743**, (C) **2797**
Luminescent materials, emission spectra of Zn silicate and Zn-Be silicate, **2795**

M

Magnesium, high-temperature oxidation, **2156**
tungstate, crystal structure, **1468**
use in electrical industry, **1233**
Magnetic field, a.c., measurement, **2753**, of small changes, (A) **1160**
of dynamo-electric machines, calculation, (D) **156**
force on current element, **1747**
galactic, **1422**
lines of force through neutral points, **2751**
of massive rotating bodies, **3112**, **3891**, **3892**
measurement by a.c. probe, (A) **3184**, **3579**
uniform, for measurement, **165**
for use with cloud chambers, (A) **1117**
—— **lenses,** spherical aberration reduction, (A) **1168**
—— **materials** (See also Alloys ; Ferromagnetic materials)
American improvements in sheet steels, **3165**
for formable magnets, **2154**
hiperco, **2820**, **3946**
isothermal remanence of $Fe_2O_3\alpha$, **3150**
modern alloys, properties, **3937**
Ni and Fe alloys, magnetic and chemical properties, **1822**
non-metallic, for h.f., **3155**
supermalloy, **2802**
vicalloy, **3554**
—— **moments,** definition, **1409**
—— **properties,** [illegible] measurement, (A) **2173**
of crystalline Ni salts, **399**
of Fe oxides at cm λ, **748**
of Fe_3O_4, **749**
of molybdenite, **126**
of sheet steel, **3942**
—— **spectra,** frequency variation, **2484**
—— **susceptibility,** measurement, **166**
Magnetism, coercive field theory, **1744**
demagnetization coefficients and hysteresis losses of Fe-Si strips, **2804**
domain theory for Fe-Ni alloys, **2137**
ferromagnetic inductance theory, **2021**
hysteresis cycles, mathematical representation, **1746**
induced, and magnetic moments, **1410**
magnetic energy, **1743**
mechanism of attraction, **3860**
theory, **3501**
thermo-remanence and metamagnetism, **2073**
Magnetization, B-H curve tracer for sound-recording wire, (D) **796**
B-H meter, for small cross-sections, **1853**
Magnetometers, airborne, **1874**
electronic, **1510**
recording, (A) **1137**
Magnetostriction, principles and industrial use, **127**
of transformer steel, **3945**
Magnetrons (See also Oscillators)
background noise and a.f. oscillations, **1643**
cathodes, physical performance, and requirements, **1270**
cavity, excess noise, **3268**
space-charge/frequency dependence, **2989**
technical problems in manufacture, **2988**
for continuous operation, (A) **294**
for d.c. voltage amplification, **3350**
electron oscillations, **3729**
energy build-up, (A) **291**, **1641**
f.m., for 4000 Mc/s c.w., **3730**
as microwave generators, theory, **2986**
performance and structure, **590**, **948**
plane, single-anode, electron trajectories, **2632**
resonant frequency of cavity, (A) **290**
rising-sun, anode structure, (A) **296**
anode theory, (A) **297**
high power, (A) **288**
multi-cavity, (A) **292**
secondary emission, **3733**
self-regulating field excitation, **1642**
with series field winding, **2631**, (A) **3349**
simple, construction and static properties, **1644**
stabilized, for beacon service, **3736**, **3737**
theory and development, Bell Laboratories' survey, **293**
tunable, donutron, (A) **947**, (A) **1258**, **2987**, (A) **3342**
tuning, (A) **289**
with water-cooled cathode, (A) **295**
waveguide-output, quartz transformers for, **2712**
1-kW, f.m., for 900-Mc/s c.w., **3731**
5-kW c.w., for 1050 Mc/s, **3735**
Magnets, a.c., **3293**
permanent, design, **2461**, **3936**, and applications, **2147**, (D) **2148**
materials and design, **445**
sintered, **3553**
theory, **3935**
for use with cloud chambers, (A) **1118**
in permeable media, **1409**
steels and high-performance magnet alloys, (B) **2823**
Maintenance, of aircraft radio, **533**
electrician's manual, (B) **1299**
preventive, for broadcasting stations, **541**
Mandelstam, L. I., appreciation and survey of work, **1283**
Mass spectrographs See Spectrographs
—— **spectrometers** See Spectrometers
Masts, B.B.C., 500-ft, **20**
radio, reinforced concrete, **1203**
Materials, for components for tropical use, **2142**
deterioration, effect of climate, **132**
loaded with spherical particles, electrical constants, **2139**, (A) **3156**
Mathematical tables, associated Legendre functions, (B) **163**
Legendre polynomials, (B) **2166**
spherical Bessel functions, (B) **3174**
Mathematics (See also individual subjects)
analysis of dynamical problems by electronic circuits, **2827**
basic, for radio students, (B) **162**
conformal transformations, (A) **1124**, **3171**
elementary presentation, (B) **467**
elementary vectors for engineering students, (B) **1128**
finite parts of integrals, **1492**
functions, periodic, analysis by periodograph, **3586**
higher mathematics for physics and chemistry students, (B) **789**
integrals $(2/\pi)\int_0^x (1/t)\tanh^{-1} t\,dt$, **2826**
Laplace-Carson transformation, **1482**
Laplace's equation, numerical solution, **785**
Mathieu functions, **460**
Maxwell's equations, matrix representation, **2475**
nearly-periodic motions, **2483**
Newton's discoveries, (B) **984**
point location by cross bearings, **103**
practical, advanced instruction, **1490**
summation of simple harmonic functions of random phase, **3566**
tangent function by potentiometer circuit, **161**
tensors and electricity, **2476**
use in electricity, **313**
Matrix theory, for impedance of closed mesh networks, **2033**, **3820**
for transmission line and impedance calculation, survey, **1329**
Measurement (See also individual subjects)
a.c., of magnetic properties, (A) **2173**
of acceleration, by radio methods, **1525**
apparatus, at Paris components exhibition, **2496**
by bridge method, of nonlinear resistors, **2501**
of conductivity of the air, **1140**
of current transients in l.v. circuit, **1845**
of dielectric constants, using waveguide, **2486**
electrical, of mechanical quantities, **824**
survey, especially a.c. meters, (A) **316**, (A) **1856**
of grid emission in valves, **2505**
of h.f. e.m. fields, **2487**
production of magnetic fields for, **165**
of *Q*, **2492**
of radiation, apparatus, **1523**
remote indication, **1499**
of resistance of laminar cores, **2170**
of sea-water velocity by induction, **3602**
of speed, stroboscopic, **1170**
of s.w.r. in waveguides, **1503**
of wall thickness by Z-callipers, **3215**
Mechanical strength, vibration test, **1147**, **2188**
Medical applications, of radioactive materials, (A) **1154**
Mesons (See also Cosmic rays) (B) **2124** ; creation of ionization bursts by, **1767** ; detector for, **2394** ; effect of scattering on mass, **2102** ; field theory, application of Riesz potential, **1411** ; heavy, (A) **1431** ; mass of, (A) **1428**, **1429**, (A) **1430**, (A) **1431**, **3111**, (A) **3882** ; mean life, **2104**, and production levels, **2101** ; momentum spectrum, **718** ; origin, (A) **1433** ; problems, (A) **1432** ; production, in lead, **2415**, at 30000 ft height, **2418** ; recent theory, **3514** ; relative stopping power of Pb and Al, **720** ; slow, disintegration, **2106**, intensity measurement, **3887**, mean life, **2105**, at 11500 ft, (A) **3882** ; and slow particles, **2098**, **2099**
Metal finishes, zinc-base, for steel, **2821**
Metallization, with Al, **2472**, of glass and ceramics, **1480**
Metallurgy, Mo for hot working, **2469** ; new research laboratory, **146**
Metals, nature of, **145**
substitute for Ni in valves, (A) **2473**
surface polish, **1483**
thermomagnetic Nernst effect, **1816**
thin laminae, optical properties, **692**
Meteorological apparatus, recent developments, **3119**
Meteorology, effects on u.s.w. propagation, **516**
handbook, (B) **1084**
marine applications, (B) **1063**
weather forecasting and E and F echoes, **2771**
Meteors, ionization production by, **2408**, **3874**
radiants, determination by radio observation, **2086**
radio detection of, **3101**
radio observations of Oct. 1946 Giacobinid shower, **864**, **1417**, **1752**, **1753**, **2085**
whistling, **2407**, (D) **2875**
Meters (See also Instruments, measuring)
electricity, consumers', a.c., (A) **316**, (A) **1856**
electronic, millisecond chronoscope, (A) **1137**
for measurement of wow, (A) **2307**
moving-coil, for current and voltage measurement, **801**
rate-of-change, **2870**
s.w.r., for coaxial lines, **3196**
Micromatch for coaxial lines, **2853**, **3188**
for v.h.f., **3201**
Metrology, electrical amplification methods, **1875**
Microfilm, See Documentation
Microphones, capacitor, pressure calibration, **334** ; supersonic, for measurement, **331** ; survey and bibliography, **1309**
measurement of characteristics, **1308**
measurement of output e.m.f., **3401**
response curve recording, **3767**
standard, for sound pressure measurement, **333**
survey, **1659**
Microwave systems, mica windows for, **3021**
Microwaves, methods of generation, **2710**
use in industrial electronic control, **209**
Mine detectors, applications, **3598**
Modulation, amplitude, **1216**, by carrier phase shifting, **539**
amplitude and frequency, comparison, **1566**, **2908**, **3660**, (D) **3661**, (D) **4030**, multitone, **3700**
of Cs-arc beam, (A) **4023**
frequency, applied to cyclotron, (A) **1161**, (A) **1162**, (A) **1163**, (A) **1164**
B.B.C. field trials, (A) **2238**
B.B.C. transmissions, **2241**
and frequency control, by electron beams, **3699**
in magnetron, (A) **3698**
mechanical system for cyclotron, **213**
narrow-band, **3327**, comparison with a.m., **2907**, with crystal control, **932**, for voice communication, **3275**
phasitron system, **2239**
and pulse, **874**
survey, (D) **2237**
and television, **2931**
wide-band, survey, **235**
measurement, of television signal, **3593**
meters, a.m., for receiving stations, **1855**
direct-reading, **1854**
phase, **1254**
circuit for f.m., **931**
pulse (See also Relay systems)
circuits, **875**
and noise, **238**
noise suppression, (A) **3269**
principles, **1933**
spectrum analysis, **4062**
terminology, **237**
theory, **2933**
relative merits in v.h.f. broadcasting, **1943**
suppressor-grid, at u.h.f., **2275**
systems, pulse, interchannel interference, distortion, **230**, (A) **1198**, multiplex, **239**
signal/noise ratios, **4029**
survey, **1583**
types and characteristics, **4061**
velocity (See also Klystrons ; Valves, v.m.)
current and power analysis, (D) **2272**
general discussion, **3352**
Modulators, f.m., phase-shift, cascade, **1253**
frequency, **1959**
for u.h.f., (B) **567**
low power, **675**
mechanical, l.f., **889**
phase, **2714**
for crystal-controlled carrier, **2274**
narrow-band, **3327**
phase-shift, cascade, **2273**
resonant-circuit, for acoustic measurements, **1762**
40-W, with cathode-coupled driver, **3703**
Moisture (See also Humidity)
content, of cereals, determined by permittivity measurement, **825**
meter, for solids and emulsions, Aquatector, **202**
Molybdenite, magnetic anisotropy of, **126**
Molybdenum, melted, ductile, **2469**
Monitoring, of keying operation, **1864**
Monotron, theory, **956**
Moon, effect on wave propagation, **2903**
Motors, d.c., electronic drives for, (A) **1154**, **3209**
Electrotor, miniature d.c. motor for low voltages, **2943**, **3261**, [illegible]
Multivibrators, circuits, **56**
Musical instruments, identification tests, **3394**
wind, tone analysis, **332**

N

Navigation, aerial, (A) **3137**
automatic, (A) **1089**, **3141**
collision prevention, **427**
errors due to aeroplane tilt, **113**
radio-beam speedometer, **215**
survey, **1090**
u.h.f. course indicator, **1094**
marine, radar specifications, **1453**
radar, survey, (D) **2128**
—— **aids** (See also Blind landing)
aerial, for civil aviation, demonstrations, **112**, (B) **496**, survey, **496**
electronic, **1455**
for landing, **3911**
P.I.C.A.O. report, **3532**
P.I.C.A.O. specifications, **2436**
survey, **2129**
marine, radar, **3531**, British postwar, **3136**, on the Great Lakes, **2432**
radar applications and Decca, **738**
radio, (B) **115**, **3134**, (B) **3135**
remote control for occasional operation, **1454**
SJ radar, **737**
in S.S. Queen Elizabeth, **529**, **1222**
radar beacons, theory and application, **3533**
systematic errors in, **2429**
types, **2434**
—— **systems,** aerial, approach, **736**
Decca, **1787**, **2430**
Gee, **1789**
hyperbolic, (A) **735**
Janus, **2435**
long range, operating conditions, **1086**, radio technique, **3910**
Navaglobe, (A) **1089**, **3140**
Navaglobe, Navar, Navaglide and Navascreen, **1092**
Oboe, **1790**
teleran, (A) **1089**, **2433**, **3138**, **3139**
75-Mc/s marker, (A) **1089**, **3143**
Navicert, **3131**
Negative resistance, dynatron as circuit element, **36**
Neon lamps, stroboscopic, **1229**
Networks (See also Circuit theory ; Filters ; Impedance ; Matrix theory ; Quadripoles)
a.c., analyser, **31**, design, **362**, (D) **3042**
closed mesh, impedance tensor, **2033**, **3820**
crystal, reciprocity failure, (A) **3450**
delay, phase correction, **2031** ; spiral, **2009**
dissipative, active and reactive power, **2700**
dividing, for loudspeakers, **3816**
dual, methods of construction, **3049**

  four-terminal, geometrical considerations, 2032 ; synthesis, 42
  n.f., theory, (B) 28
  minimum phase-shift, 2699
  parallel-T, for RC oscillators, 659
  passive, constants of, 3821
  phase-shift, wide-band, 1021
  π and T, transfer impedance, 657
  reflection-coefficient meter, 18
  relation between transition time and pass band, 2034
  RC, parallel-T, 40, 3452, (C) 3453
  resistance, for computer circuits, 1022
  theory, unification, 38
Neutrons, nature of, 398
Night sky light, altitude of emission, 2119 ; intensity measurements at Calcutta, 2776 ; origin, 3127
  spectrum, 2097, 3904, measurements, 2424
Noise (See also Cosmic noise ; Fluctuation ; Solar noise ; Valves)
  and conversion gain measurement, 2229
  factor, definition, 864, discussion, 2919, measurement, 1196
  flicker, in valves and semiconductors, 4087
  impulse, in f.m. receivers, 857
  limiters, 866, 1576, survey, 867, 1202
  measurements, on crystal mixers, 2569
  meters, 3582, (A) 3591, accuracy, 2227
  noise figure determination for microwave receivers, 2229
  and pulse modulation, 238
  receiver, input circuit, 2228, theory, (A) 1199, visual measurement, 2570
  rectifier response, 1565
  reduction, in c.w. reception, 1576, 3647, 3649
  signal generator for, 2859
  solar, galactic and aerial, survey, 1575
  sources, coaxial-line diode, for u.h.f., 3722 ; cold-cathode tubes for, (A) 589
  suppression, in gramophone records, 991, in television receiver, 271
  valve and circuit, in amplifiers, 3834
    in diodes, 3343
    equivalent circuit, (A) 37
    filament, with a.c. supply, 526
    in gas valves, 2401
    measurement, amplifier for, 2718
    in mixer stages, 1573, (C) 2918
    random, probability density, (A) 1127
    in receivers with square-law detectors, 3645
    shot effect, application of random distribution theory, 278, in multiplier tubes, 1628, in transit-time valves, 1574
    spectrum, of crystal rectifiers, 2567
Nomenclature, French terms of English origin, 1280
  scientific, international suffixes, 597
  system for glass bulbs, 2975
  use of word 'electronics', 2294
  words, wartime, and their meanings, 4093
Nomograms See Abacs ; Charts
Nonlinear systems, natural frequencies, 669
Nuclear physics, 1067
Nucleonics, and electronics, 3745

O

Ohm's law, definitions, 1063, (D) 2393
Opinion meter, 1533
Optics, of thin metallic laminae, 692
Oscillations, in coupled systems, 2728
  electron, u.h.f., theory, 3470
  forced, with nonlinear restoring force, 53
  in hot-cathode arcs, 1406
  modulated, frequency spectrum, (A) 2221
  with rectangular frequency spectrum, 926
  relaxation, bridge circuit, 2362
  sawtooth, Fourier analysis, 784
  self-, conditions for, 1703, mechanism of, 1701, multiple, on single wire, 1728
  transit-time, 3468
  u.h.f., in ordinary valves, 4080
Oscillators, a.f., construction, 622 ; RC, 1039 ; Wien bridge, 8
  bandswitching v.f.o. exciter, 3828
  beat-frequency, h.f., 1709, 1850, 2358, 3827
  for cm waves, 3347
  coaxial, mode separation, 1332
  coaxial-cavity, using reflex klystrons, (A) 1026, 3058
  coupled-circuit, (A) 3459
  crystal, stability, 2704
  h.f., chemical applications, 1893
  l.f., RC, 1038 ; thermistor-regulated, 195
  linear sinusoidal, radiation field, 356
  loaded unstabilized, stability and frequency pulling, 667
  locking phenomena, 1037
  magnetron, with transmission line, (A) 3449
  master, permeability-tuned, 2363
  microwave, using disk-seal valves, 2709 ; electronic frequency stabilization, 1690
  modulated, stabilized, 1381
  phase-shift, 2355
  power, h.f., f.m. of, (A) 1026, 3055
  pulse-modulated, 2357
  RC, amplitude control, 3825 ; beat-frequency, 672 ; parallel-T networks for, 659
  reflex, (A) 673, (A) 1026, 3057 ; u.s.w., multi-reflection valve, 2828, with wide tuning range, 2291
  relay, 100 c/s to 10 c/hr, 1030
  response to external e.m.f., 382
  self-frequency instability, 2707
  triode, calculation, 2042
  u.h.f., 3056; class-C operation, 2290; ring, 1623; stability improvement, 2708
  valve, for lecture demonstration, 3053 ; positive-grid, effect of space charge on frequency, 1969 ; principles of power addition, 3826 ; theory, 1380
  variable, frequency increments, 666
  3-phase, RC, for r.f. and a.f., 2356
  6C5, for 54 Mc/s, 2359
Oscillatory systems, with distributed parameters, interaction, 2386
  stability conditions, 1497
  with two degrees of freedom, 377
Oscillography See Cathode-ray oscillography

P

Packaging, use of plastics for, 773 ; valve-crate design, 2153
Painting, use of e.s. fields, 1883
Paper screen, for ballistics measurements, 489
Paraffins, breakdown strength, 764
Particle accelerators (See also Electron accelerators ; Ion accelerators)
  cavities and waveguides for, 2200
  stabilization by grid lenses, 2382
Particles, charged, e.m. induction in rotating cosmic bodies, 1750
    field due to motion, 392, 393
    flow in gases between concentric cylinders, 394
    in magnetic field, hodoscope for trajectory, 2062
    motion in magnetic and electric fields, 2426
    trajectory in magnetic field, demonstration model, 76
  elementary, survey, 1400
  helical motion in uniform magnetic field, 2755
Periodic systems, wave propagation in, 1376
Permalloy, complex permeability, (A) 3923
  tape, for h.f. transformers, (A) 3162
Permeability, complex, of iron at 200 Mc/s, 3182, (A) 3183, of metals, measurement at u.h.f., (A) 2852, of permalloy, (A) 3923
  dispersion in ferromagnetic materials at u.h.f., 1460
  of dust cores, (D) 35, 1692, 1693, (D) 3938, 3939
—— tuning, in f.m. band, 1718
Phase correction, in delay networks, 2031
  detectors, 474
  front, plotter for cm waves, 3590
  inverters, cathode, design, 3815
Phase-integral method, application to propagation problems, 2546
Phasitron, development, 2239 ; operation and applications, 277
Phosphorescence decay, in Cu-activated ZnS, (A) 2443
Phosphorescent solids, dielectric changes in, 2444
Phosphors, infra-red sensitive, 120, 121, brightness decay, 1459, ZnS, preparation and characteristics, 122
  thermal and X-ray analyses, 3539
  thermoluminescence and conductivity, 743, (C) 2797
  ZnS, dielectric properties, (A) 3148
    with long afterglow, effect of impurities, 1814
    luminescence processes, 1104
    with ultraviolet excitation, 3919
Photo-effect, in carborundum crystals, 1807
  of Cu_2O, effect of impurities, 2283
Photoelectric cells, (B) 3358
  applications, dustmeter, 1536 ; electronic micrometer for wire and strip measurement, 197 ; logarithmic photometer, 830; sound reproduction, 2199
  barrier-layer, a.c. behaviour, 3332
  bridge type, using photoconductive Si, 1961, (A) 4064
  elimination of residual current, 2278
  German, infra-red, (A) 1256
  multiplier, use for photometry, 3331
  PbS, manufacture and theory, 3709
  recent developments, (A) 1154, 3330
  Se, 2281, barrier-layer, fatigue, 3710, gaseous nature of non-conducting layer, 2282, parallel operation, 2280
  shot effect in, 3329
  thallous sulphide, 2972
  use of light alloys, 1226
—— effect, in television, 1398
Photoelectricity, current amplification, 1714
  fatigue effects at Ag–Cs_2O and Ag–Cs surfaces, 2971
Photography, electrical discharge flash-tubes for, 499 ; exposure timer, 200 ; rapid production of records, 459
Photometer, photoelectric, sensitive, 3995
Photons, de Broglie equations, interpretation, 1395
Photophysics, theory, 1058
Photo-recording, of oscilloscope images, 2849
Phototelegraphy See Facsimile
Photovision, 4022
Physics, atomic, popular introduction, (B) 1072
  electricity and magnetism, principles, (B) 82
  electrons and Dirac's quantum electrodynamics, 389
  and engineering, 3363
  force on current element in magnetic field, 1747
  force between parallel currents, 1745
  nuclear, principles, 709
  reports on progress, (B) 1415
  1946 review, 2725
Pickups, acceleration, vacuum-tube, 2528, (A) 4001
  carbon, using strain gauge, 613
  gramophone, variable reluctance, (A) 7
  impedance measurement, 3400
  moving-iron, 3759
  position, electronic, 1511
Piezoelectric crystals, equations in tensor form, 3497
  forced and free oscillations, 381
  KD_2PO_4, dielectric constants, 2448
  KH_2PO_4, inverse effect, 2449
  KH_2PO_4 and KD_2PO_4, electro-optical properties, 2450
  KH_2PO_4 and KH_2AsO_4, dielectric constants at low temperatures, 2451
  KH_2PO_4 and Rochelle salt, temperature effect, 2447
  Rochelle-type, effect of foreign ions, 2800
    elastic behaviour, 2446
    specific heat, 2448
—— substances, 2445, propagation of elastic waves in, 2057
Piezoelectricity, control of twinning in quartz, 2141
  equivalent circuit of crystal, 482
  properties of $NaClO_3$ and $NaBrO_3$, 752, (A) 3925
  survey of crystal physics, (B) 2084
Plasma, oscillations, excitation, (A) 1061
    theory, 2747
    due to unbalanced distribution, 2066
Plastics, advances in 1946, 3948
  annealing for strain removal, 2160
  British catalogue of, (B) 3949
  chemistry and uses, (B) 1123
  developments, 2140
  dielectric applications, 762
  dyed, as optical and infra-red filters, 3541
  in electrical industry, (A) 1122, 1835, survey, 2161
  laminated, in engineering, 457, manufacture in Germany, 456
  low-loss, 3931
  as mounting material for metallurgy, 458
  for packaging, 773
  polystyrene, as h.f. dielectrics, 763
  polytetrafluorethylene, teflon, 149, (A) 1121, 3169, 3559
  polyvinyl chloride, softening of, 1488
  for production, (B) 2824
  progress, 150
  thermosetting, effect of weather, 1489, test methods, 1865, and thermoplastic, 3558
Polar molecules, dipole moment and moment of inertia, 707
Polishing, electrolytic, electron diffraction examination, 2873
Polymers, breakdown strength, 764
  fluid, dielectric properties, 1830
  tetrafluorethylene, teflon, 149, (A) 1121, 3169, 3559
Polythene, breakdown strength, 2146
  power factor, effect of combined CO, 2145, (A) 3161
  survey and applications, (A) 1487
Potential, of conductor in earth's electric field, 1081
Potentiometers, a.c., 1515
  self-balancing, 184
  wire for improved performance, 1691
Powder metallurgy, 2464, application to radio engineering, 2818
  bibliography, 3941
  compressed kovar, 1479
  copper-base parts, 1883
Power, apparent, definition and measurement, 1507
  maximum transfer of, 369
  measurement, a.c./d.c. comparator for, 183, (A) 803
    with coaxial-type water load, 2172, 2493
    microwave, 2850
    v.h.f., bolometers for, 189
  reactive, sign of, 971, 1289, (D) 1972, (D) 2642, (D) 3369, (D) 4092
  transmission by radio, efficiency, 3623
—— factor measurement, end-leakage prevention in cables, 176, (A) 795
—— supplies, d.c., choke control rectification, 546
  h.v., battery-operated, 258 ; for c.r. tube, 904 ; for television receivers, 4047
  stabilized, 2947, 160–1500 V, 3675
  for u.h.f. equipment, 1951
  voltage multiplication with Se rectifiers, 2255
  30-kV, 257
Precipitation static (See also Atmospheric electricity)
  at altitudes to 26000 ft, 2425
Pressure measurement, electronic method, 1553
Probability problems, in electrical engineering, 465, (D) 3173
  theory, experimental introduction, (B) 164
Projectors, cm λ, 1622
Prospecting, geophysical, by airborne magnetometer, 3245 ; survey of methods, 1524 ; use of e.m. waves, 3606
  oil, using airborne magnetometer, 1874
  radio, subterranean method, 216
Protective finishes, for electrical equipment, (A) 3843
  Zn plating, 3927
Protons, range-energy values, 1736
Public address systems, in auditoria and railway stations, 1314 ; at Lake Success, 1992, and Flushing Meadows, 1315 ; for large outdoor arena, 994
Publications, "Broadcasting" Year Book, (B) 243
  Bulletin Analytique, 1281
  electrical engineer's pocketbook, (B) 322
  Radio Amateur Call Book, (B) 1292
  Radio Component Manufacturers' Federation catalogue, (B) 2055
  reference data for radio engineers, (B) 3383
  scientific, Royal Society report on, 595
  U.S. Government, 4102
  Wireless Trader Year Book, (B) 606
  World List of Periodicals, 1653
Pulse generators, nonlinear coils for, 1051
  with variable time delay, 256
—— systems, insulation for, 1477
  transmission, minimum pass band, 665
—— technique, 3054
  in broadcasting, 1932
  generation of pulse voltages, 2698
  survey, 1585
Pulses, frequency measurement, 1505
  high-speed recording circuit, 1149
  polarity converter, 3446
  reception, visual, aural and recorded, 1919
  transmission through amplifiers, 51
  width measurement, 2851
  width and slope measurement, 3567
Pumps, diffusion, oil, self-fractionating, tests, 1597
  vacuum, 1102
Pyrometry, with valve voltmeter, 826

Q

Q circles, 2360, for analysis of resonant microwave systems, 2711
—— code, and Russian equivalents, 2923
—— meter, for cm λ measurement, 1506
  for servicing, 1850, 1851
Quadripoles (See also Networks)
  coupling, theory, 1387
  between source and dipole, theory, 660
  theory, 3817
Quantum mechanics, of fields, 687 ; philosophical foundations, (B) 321 ; relativistic, 686
—— theory, of e.m. field, 2384
Quartz, piezoelectric, 2373
—— clocks, for astronomical use, 194
—— crystals, artificial electrical twinning, 1463
  electrical characteristics, 3574
  growing by hydro-thermal methods, 1825
  meter for equivalent circuit constants, 482
  supersonic power output, 2442
  test instrument, 167
  thermal voltage, (A) 3848
  variations in, (A) 3926
—— oscillators, characteristics and uses, 2703
—— plates, in plane shear vibration, equivalent circuit, 2341

R

Radar, airborne, naval, 109 ; for night fighter aircraft, 3147 ; search, 110 ; specifications, U.S., 1805 ; 3-cm, for carrier-based planes, 111
  applications, map-making, 2537 ; measurement of interplanetary distances, 105 ; in meteorology, 3129 ; radar-beam aircraft speedometer, 215 ; storm detection, 2438 ; submarine detection, 425, 739, (B) 741
  basic equations, 3013
  bombsight, low-altitude, 1457
  cm, for naval gunnery, 2791
    receiver design, 2562
  countermeasures, 2790
  definitions, 740
  developments, in Canada, 2133, in France, 1099, in Great Britain, 104, 1098, survey, 3144
  echoes from shell splashes and sea spray, 423
  French contributions, 1796
  frequency-band allocations for ships, 2788
  ground, scanning equipment, 738
  H_2S, 1793, training devices, 1797
  i.f.f. identification system, 1456
  interrogator-beacon 200 Mc/s, 1791
  introduction to, (B) 114
  Japanese, survey, 424, (A) 3538
  marine, 3531; British postwar, 3136; on the Great Lakes, 2432
  medium-precision, application and design, 1800
  naval, for fire-control, 1798, (D) 1802, 2437, design, 1801 ; theory of performance on ship targets, 2904 ; 3-cm, demonstration, 1096
  navigation, survey, (D) 2128
  non-technical survey, (B) 2134
  precision, for close-range weapons, 1799 ; using crystal timing standard, 1804 ; for fire-control, angular accuracy, 1803
  principles, (B) 2792, and applications, 1794
  range, maximum, 2130, zero error measurement, 1806
  reflection, from metallic strips, theory, 1687; from moon and planets, 106, (C) 731, 2232; from wires, theory, 3035
  SJ, for submarine use, 737
  sea echoes, at cm λ, 3257, frequency characteristics, 2218
  sensitivity, 1095
  systems, survey, 1795
  testing techniques, 478
—— apparatus, aerials, survey, 358 ; coil pulsers, 674 ; c.r. tubes, war-time developments, 2983, Service problems, 2984 ; echo timer, 3063 ; fire-control, computer, 1494, circuits, 1022 ; radial p.p.i. timebase, 3829 ; spark gap switches, 899 ; test equipment, echo boxes, 3598 ; valve developments, 2288
Radiation, from electron passing from one medium to another, 2402
  and electron scattering, 701
  e.m., 2754
  equilibrium in ionosphere, 2423
  of fast electrons in magnetic field, 2732
  of linear sinusoidal oscillator, 356
  measurement apparatus, 1523, at m and cm λ, 1863
  microwave, from sun and moon, 3103
  thermal, measurement, 1155, at u.h.f., 475
Radio, classification of subjects, 607
  development, (B) 3382, 1945–1946 papers, 2637
  experimental, (B) 324, (B) 609
  industry, technical educational requirements, 4096
  for merchant ships, (B) 3666
  reference data, (B) 1302
  scientific problems, 3374
  survey of theory and applications, (B) 608
  techniques, obsolete, revival, 3375
—— engineering, reference data, (B) 1301
—— links See Communication systems ; Relay systems
—— technology, research and development, 975, second year, (B) 3384
Radiogoniometers, design for m.f., 3127, (A) 3133
Radiography, microsecond, 3240
  by secondary emission, 1549
Radiosonde, British, (D) 1773

  coding type, (A) 3964
Radio telephony (See also Communication systems)
  circuits, 540
  mobile system, 3288
  multi-channel, 1594
  railway, 885
  rural 44-Mc/s system, 3659
  on 250–300 Mc/s, 2604
Random fluctuations, Campbell's theorem, 29
  probability density, (A) 1127
Reactance comparator, 804
  variation, devices for, 1391
Reactors, a.f., design, 2884
  saturable, for automatic control, 1228; negative resistance effects, 3692
Receivers (See also Communication; Radar; Television)
  automatic controls for, 2914
  automatic production by E.C.M.E., 1913, (A) 2909, (A) 2555, 2556, 4010
  BC-348-Q, modifications for amateur use, 1568
  BC-624, conversion for λ 2 m, 4015
  battery-operated, constructional details, 2560
  broadcast, density in different countries, 3000
    European, war-time, 1570
    temperature and frequency drift, 2557
    tuned circuits for, (D) 1195
    tuning devices, 1194, (A) 1918
  clipping and clamping circuits, 4012
  communication, design, 223, 861, (A) 1189
    naval, 860, u.h.f., design, 2222
    V55R, 1192
    60–15 m, 1190
  design, for cm radar, 2562, using split-stator circuit, 522
  diversity, design, 3636
  Ekco Model A28, test report, 1914
  f.m., application of superregeneration, 4017
    converter for, 225
    design, (A) 1188, 2365, 3259, 4013
    impulse noise, 857
    u.s.w., for R/T, 3263
    v.h.f., testing procedure, 2912
  f.m./a.m., design, 4011
  heterodyne, mixer design for v.h.f., 3641
  high-fidelity, 2910, construction, 855
  high-precision, tunable, for v.h.f., 2913
  midget, 3637, home-made, 862
  with miniature valves, 3260
  Murphy A104, 859
  noise and output limiters for, 867, 1202
  operation on 28V, 3261
  production in Holland during occupation, 2225
  with quartz control and automatic tuning, 1912
  Radio L. L. Synchrovox 645A, 1567
  RME-45, 224
  RME-60, improvements, 3635
  radio and television, servicing, (AD) 222
  sensitivity, at h.f., specification and measurement, 2568
    specification at u.h.f., 193
  for signal generator testing, 50 kc/s to 50 Mc/s, 858
  with square-law detector, theory, (A) 1199
  superheterodyne, amateur band, 1916
    communication, λ 2 m, design, 4016
    Single-Span, λ 200–2000 m, 1917
    tracking error, 524, plotting, 1569
    tracking formulae, 226
    for λ 2 m, details, 2223
    for λ 10–80 m, 2564
  superregenerative, λ 2 m, 523
    v.h.f., 1193
  synchrodyne, 2364, (D) 3638
  universal, RU95, 4014
  v.h.f., crystal control for, 1363
  1946 models, circuit diagrams, (B) 1056
Reception, amateur-band, narrow-band f.m., 2220
  at Bangalore, effect of atomic bomb, 851
  diversity, 1920
  f.m. *vs* a.m., 1566
  high quality, conditions for, 1191
  panoramic, panadaptor, 521
  transatlantic, on 50 Mc/s, 1560
Recorders, pen, statistical, for e.m. variations, 2251
Recording (See also Sound recording)
  of current and voltage fluctuations, 792
  electrochemical, 2862
Rectification, crystal, and diode theory, (A) 285
  at metal-semiconductor contact, 3086
  thermal, energy, 2143
Rectifiers (See also Detectors; Discharge tubes; Ignitrons)
  barrier-layer, mechanism, 1468, (D) 3544
  biased, ideal, theory, 3506
  cold-cathode, 3706
  crystal, Si, development, 4065
  CuO, ageing of, 755
    vs thermionic valves in voltage-doubling circuits, 2025
  Cu_2O, effect of impurities on photo-effect, 2283
  dry, applications, 894
    characteristics, production and applications, 1469, (D) 3545
  gas-filled, circuit cushioning for increased life, 361, (D) 3040
  Ge, *p*-type, photo- and thermo-effects, (A) 2456
    welded contact, properties, 2276
  grid-controlled, for r.f. heating, 199
  Hg-arc, ignition mechanism, (A) 3670
  Hg-vapour, commutating reactors for, 360
  high-vacuum, 3707
  metal, TiO_2, 248
  response to random noise, 1565
  saturable-choke-controlled, 546
  Se, for broadcast receivers, 2582
    construction and applications, 895
    and CuO, 2581
    for voltage multiplication, 2255
  Si, contact potential, 3869
    and Ge, 3881
  use of light alloys in, 1286
  valve, electrolysis in glass stems, 447
Reflection coefficients, measurement in waveguides, 3788
  by stratified system, 3865
Reflectometer, for s.w.r., theory and design, 3861, 3968
Reflectors, corner, optical theory, (A) 2389
  parabolic, theory, 2337
    calculation of e.m. fields, 2687
  spherical, as microwave scanning aerials, 1342
Refraction, between absorbing media, 2729, 4006
Regulation, automatic, in electroacoustics, 3767
  electronic, of motor speed, 1146, (D) 3193
Relativity, matter and energy relations, 388, (D) 685
Relaxation methods, for magnetic field calculation, (D) 156; in theoretical physics, (B) 466
—— **phenomena**, in anisotropic liquids in electric field, 1068
Relay systems (See also Radio links)
  radio, 2835
    for facsimile transmission, 265
    with lunar reflection, 106, (C) 731
    microwave, (A) 1217, 1578, 2576, 3282, 3283
    multiplex, 1586
    p.m. multiplex, 1213, 1219, (A) 4039
    pulse time division, 3281
    for telegraphy, 878, 2934
Relays, capacitance-operated, 2583
  electronic, 488, 3968
  telephone, use in electronic circuits, 3294, 3678
  vacuum-sealed, for h.v., 898
Remote indication, of measured quantities, 1499
  of moving objects, 1510, 1511
Research, in industry, (A) 307, in small firms, 968
  progress in various fields, General Electric Co., 2641
  scientific, in Australia, 1651
Resins, annealing of, 455
  casting, for stabilizing valve circuits, 3928
  synthetic, chemistry and uses, (B) 1123
Resistance, high, measurement of, 3190
Resistivity, of conducting rubber, (A) 3168
Resistors, attenuator construction, 1390
  non-metallic, for h.f., 1019
  nonlinear, bridge method of measurement, 2501
  non-ohmic, mechanism of, 2344
  in parallel, geometrical addition, 2379
  SiC, 141, (D) 1115
  standard, in parallel, chart, 680
Resnatrons, main features, 1639
Resonance, ferromagnetic, microwave, of supermalloy, 3861
Resonant systems, linear, response of, (A) 3813
Resonators (See also Acoustic resonators)
  cavity, coupled by aperture, 3462; design formulae, 3460; flat, 3463; for measuring cm waves, 3187; self-excitation, 3461
  crystal, bandpass effect, 1721
  cylindrical, natural frequencies, 2354
Reversibility, microscopic, Onsager's principle of, 65
Rotation, absolute, and rotating magnet, 3064; nature of, 390, 1727, 2727
Rubber, advances in 1946, 3947
  in engineering, (B) 2163
  loaded with carbon black, electrical conductivity, 3567
  manufacture and use of colloidal carbon for, 1486
  natural and synthetic, comparison, (A) 780
  research on extraction, 1295
  research at Illinois, 2158
  science of, recent advances, (B) 1837
  synthetic, physical constants, acoustic study, 2159
    research, 454
Rutherford, collected papers in Cavendish Laboratory, 1278; life and work after 1919, 3365; and modern world, 3366

S

Safety, harm from exposure to X rays and γ rays, 973; physiological effects of electric currents, 310, (D) 3368
Salt solution, conductivity, effect of supersonic waves, 1397
Schottky effect, 1841
Science, appreciation of scientific approach, 959; politics and national welfare, 3362; recent progress, survey, (B) 1297; war-time developments, 965
Screens (See also Cathode-ray screens)
  e.m., power loss in, 33
  cylindrical, for coils, 2077, (A) 3502
Screw threads, standardization, 604
Sealing, pressure, by zip fastener, 1592
Seals, glass–metal, 119, 431, 1465, 1466, 3918; stresses in, 430; for waveguides, 1231
  glasses for, 1467
  metal-ceramic, 3917
Selectivity, variable, by counter-retroaction, 1041
Semiconductors, 3546
  conductivity law, 698
  conductivity in strong electric fields, 1818
  impurity levels, thermal ionization, 2453
  mechanism of luminescence, 1810
  properties of cerium tungstate, 1112
  thermomagnetic Nernst effect, 1815
  various papers, (A) 1828
Servicing, manual, (B) 2303
  measuring instruments, 1850
  of receivers, (B) 2572, radio and television, (AD) 222, 2224, (A) 3640
Servomechanisms, in aircraft, (A) 4039; amplidyne regulating systems, (A) 4039; analysis by electrical analogies, 543, (D) 891, (D) 3287; in army equipment, (A) 4039; and automatic regulators, (A) 4039; in chemical industry, (A) 4039; demodulators for, (A) 1224, 3290; design, and behaviour, 246, and circuit theory, 1016; electronic simulators, (A) 4039; elements of position control, (A) 4039; frequency-response analysis, (D) 3289; for generator voltage control, (A) 4039; nature of operator's response, (A) 4039; in naval equipment, (A) 4039; parallel circuits, (D) 3288; in process control, (A) 4039; and regulator systems, industrial, (A) 4039; stabilization theory, 245; theory, 890; torque motor for, 247
Signal generators, buzzer, for 3000 Mc/s, 57
  calibration, 3202
  construction, 3970
  f.m., (A) 3200, design, 818
  f.m./a.m. 3–14 Mc/s, 3969
  for receiver production testing, 3971
  standard, 40–1000 kc/s, 2858
  sweep-frequency, 3199
  u.h.f., 811
  v.h.f., 3588
Signal/noise ratios for principal modulation systems, 4029
Signal tracer, crystal diode probe for, 2506
  for receivers, 856
Silicon, Hall effect and resistivity from 10° to 600° K, (A) 2452
  photoconductive properties, 1961, (A) 4064
—— **carbide**, conductivity, 745, mechanism of, 1820
  resistors, 141, (D) 1115
Silicones, developments, 2140
  dielectric constant, 761
  oils, applications, 1461, properties, 760
  popular survey, 436
  preparation, properties and uses, 1187
  survey and uses, 129, 758
Silver coatings, new types, 3166
Skiatrons, for p.p.i. display, (A) 302
Societies and organizations, British I.R.E. annual report, 2296
  Bureau of Standards war-time activities, 3743
Sodar, and detection of atmospheric irregularities, 330, (A) 3751
Soil, Indian, dielectric properties, h.f. and m.f., 1900
  load-bearing properties, 102
Solar activity, and atmospherics, 1564
  data for July–Sept. 1946, 1755, Oct.–Dec. 1946, 3102, Jan.–March 1947, 3876
  effects on wave propagation for λ 20–24000 m, 2550
  flares and radio fade-outs, 3881
  geomagnetic effects of eruptions, 3880
  and geomagnetic storms, in 1945, 90, in 1946, 1754
  and luminescence of earth's upper atmosphere, 3105
  slow corpuscular radiation, 3877
  and variations of magnetic declination, 2089, 2090
—— **atmosphere**, structure, 2409
—— **corona**, and geomagnetic disturbances, 3117
  observation by coronagraph, 400
—— **eclipse**, of 9th July 1945, and radio observations, 2092, 2093, 2094, 2411, 2412, u.s.w., 2095, 2096
—— **magnetism**, theoretical interpretation, 3115
—— **noise** (See also Noise) (A) 2758
  circular polarization, 86
  and cosmic noise, survey, 402, 1757
  at m λ, 3508
  microwave, during partial eclipse of Nov. 23, 1946, 2761
  origin, 2088, (D) 3104
  during radio fade-outs, survey, 403
  at λ 3.2 cm, 3106
—— **phenomena**, charged particles, and cosmic ray increases, 1438
  faculae, and geomagnetic activity, 92
—— **radiation**, r.f., emission from solar atmosphere, 1759; at m-λ: origin, 87; at m and cm λ, 1074; magneto-ionic theory, 404; polarization, 88; theory, 1758, 2067; at 175 Mc/s, 89; at 480 Mc/s at Illinois, 1760
  thermal, at ~10⁶ degrees K, in radio spectrum, 716, at λ 1.5 m, 717
  at 72 Mc/s, and solar flares, 406
  at 75 Mc/s, and solar activity, (A) 405
—— **spectrum**, ultraviolet, up to 88 km above earth, 1421
Soldering, soft, 449, induction heating for, 1554
  of stranded wire, 2486
Sound (See also Acoustics)
  absorbers, 3005
  attenuation in water, (A) 2307
  diffraction, by circular disk, 1978
    of pulses, 3
    by spheres and cylinders, 3390
  echoes from the atmosphere, 2310
  effects, radio, (B) 1000
  field plotter, 3389
  pressure measurement, 333
  reflection, from rough surfaces, (A) 2307
    from sea surface, (A) 2307
  trajectories in atmosphere, 1988
  transmission system, with recorder, 344
  underwater, lens for, (A) 2307
  velocity of, theory, 2
  vibrations, applications, 3973
  waves, frequency changing, (A) 985, 3048
—— **absorption**, by porous rubber, 341
  properties of materials, 3763
—— **propagation**, along boundary, 3387
  through liquids, 3388
  in non-uniform fields, 329
  of pressure waves in Hg at 100 to 1000 Mc/s, 3755
  underwater, 2655
    l.f., effect of bottom, (A) 2307
—— **recorders**, embossing type, 3012
  film, survey, 9
  magnetic, 1995, 2321
    magnetophon, tape manufacture, 2320
    tape, 1832
  paper tape, adaptation for broadcasting, 3773
  wire, wow in, 1987
—— **recording**, 1657
  absolute calibration by light patterns, (A) 2307
  for amateur 16-mm film, 2322
  disk, amplifier for, 618
    bibliography 1921–1947, 3013
    with embossed groove, 3414
    embossing at high frequencies, 1986
    lateral, 348, 1993, 3011
  film, frequency response of sound channel, 995
    historical development, 3412
  magnetic, choice of medium, (A) 2307, 3415
    on coated paper tape, 1996
    developments, (A) 985, 1994, (A) 2319, 3014
    equipment, design problems, (A) 2307
    for motion pictures, 1997, 3416
    physical aspects, (A) 2307
    recorder head design, (D) 620
    signal and noise levels, (D) 619
  master wire recorder, (A) 2307
  reduction of amplitude distortion, (A) 2307
  resonant circuit modulator, 1702
  studio design, 2314
  survey, 3771, 3772
—— **reproduction**, 1657
  for amateur 16-mm film, 2322
  aural preferences, 1185, (D) 2554
  background noise reduction, (A) 985, 3006
  disk, stylus for, 3408
  film, noise reduction, 3417
  high-fidelity, 3407
  listeners' preferences, (D) 612, (D) 2656
  reduction of record scratch, (A) 2307
  response equalization, 3774
  using S-Tl photocells, 2199
  survey, 3771, 3772
  transition frequency compensation, 3760
  wow, causes and measurement, 990, meter, (A) 2307
Space charge, effect on positive-grid oscillator frequency, 1969
Spark discharge, current and voltage curves, 2065
  extinction by electric fields, 1740
  mechanism, 699
  physical mechanism, 1060
  at v.h.f., voltage recovery, 700
Specifications, instrument landing, P.I.C.A.O., 2436; U.S. airborne radar, 1805
Spectrochemical analysis, microwave, 1891
Spectrograph, c.r., 3219
  microwave, 3205
Spectrography, infra-red, of molecular groups, 2061
Spectrometer, mass, applications, (A) 1154, 3204
    for leak detection, 2441, 2793, 2794
Spectroscope, infra-red, with c.r. presentation, 2860
  microwave, theory of, 1519
Spectroscopic analysis, using electron multiplier, 831
Spectroscopy, β-ray, magnetic field for, 1868
  electronic, applications, 1535
  microwave, Stark and Zeeman effects, (A) 3867
  r.f., magnetic resonance method, 1731, (A) 3845
Spectrum analysers, r.f., 1504, u.h.f., 2855
  analysis, of night sky light, 2097
    principles, and analyser for, 477
  infra-red, of H_2O and D_2O, (A) 3846
Speech intelligibility, and amplitude distortion, 333; effect of clipping, 1981; factors governing, 1979; at high altitudes, effects of distortion, 1983; in noise, 335; premodulation clipping, 1980; in telephony, peak clipping, 336, training for, 339
  masking, by standard waveforms, 337
  measurement, and microphone survey, 1659
  waveform analysis, 1982
Stability criteria, of Nyquist and Leonhard, 2022
Stabilization (See also Frequency)
  voltage, by corona discharge, (A) 3983
    of d.c. supplies, design theory, 4046, graphical analysis, [illegible]
    improved arrangements, 1595
    improved valve, 2277
    by nonlinear bridge circuits, (D) 44
Standard frequency (See also Frequency)
  transmissions, WWV, 2484, 2849
  transmitters, WWV, 3690
Standardization, American Standards Association, functions of, 1279
  of radio components, 978, 979
  of screw threads, 604
  of valve bases, 980
  of wiring codes, 1290
Statistics, in counter technique, 1877
  graphical methods, 464
  punched-card system, 788
Steatite, for h.f. insulation, 139
Steel, transformer, radar, 1834
Storm detection, by radar, 100, 2438
—— **location**, by d.f., (A) 2126, 2779, (A) 3686
Stratosphere See Atmosphere
Stroboscope, aids for speed measurement, 1170
  principles, and applications to loudspeakers, 617
Studios See Acoustics; Broadcasting; Sound recording; Television
Submarine detection, sonar, 2427, 2777
Sun, magnetic field, theory, 1766
Sunspot cycle, and atmospherics, 2122
  and long distance radio communication, 1490
Sunspots, characteristics, and effects on radio, 91
  magnetic field, 1761, growth and decay of, 3869
  movements and origin, 1419
  next maximum, 1077
  numbers, provisional, July–Sept. 1946, 1762, Oct.–Dec. 1946,

3106, Jan.–March 1947, 3879
structure, 2091
and telegraphy, 3878
of March 3–17, 1947, 2760
in March and April 1947, 3107, 3510
Superconductivity, 3087
of frozen metal-ammonia solutions, 714
magnetic quenching, 3088
magnetic threshold curves, 3852
practical possibilities, 3851
and r.f. detection, 1915, (A) 3853
Superconductors, magnetic transition curves in Ta, (A) 3149
Supermalloy, ferromagnetic resonance at u.h.f., 3861
Supersonics (See also Acoustics ; Absorption ; Sound)
absorption in liquids, at 75–280 Mc/s, 3752, at 100–225 Mc/s, (A) 3753
applications, 967, 2311, 3973 ; depth sounding and flaw detection, 2184 ; garage-door opener, 2312 ; industrial, 3756, 3757 ; leak detection, 3603 ; radar trainer, (A) 2307 ; survey, 1305 ; thickness measurement, 3594
directional radiation of vibrating disk in baffle or horn, 328
effect on conductivity of salt solution, 1397
and flight of bats, 4
generators, 3757
intensity comparison by magnetostriction gauge, 3580
lenses and transmission plates, (A) 2307
power output of quartz crystal, 2442
propagation, in Al and glass rods, 3393, in open air, 1989
surface reflection of pulses in the sea, (A) 2307
velocity and absorption, in liquid mixtures, 1975
waves made visible, 3754
Surface finish, of Cu, study by electrolytic polishing, (A) 2155 ; electrolytic polishing, (A) 1831, 2151 ; of metals, superfinish, 1483 ; texture, Talysurf meter, 1534
hardening, of Al and alloys, 2465 ; of crystals by polishing, [illegible]
study, of metals by electron diffraction, 768
Surge generator, 2½ MV, 2847
Switches, electronic, 1151, 3443 ; adjustable, 3808 ; for pulse production, 3047 ; 4-channel, 3445 ; 4-way or 6-way, [illegible]
Hg, potential distribution at igniter, 2250
r.f., for broadcasting transmitters, (D) 3022
rhumbatron, for waveguides, 1325, (A) 1672
spark gap, for radar, 899
t.r., de-ionization time, 1633, and electron conductivity in gases, (A) 76
waveguide, high-speed, 2253
Symbols, for circuit diagrams, 2030, 3812 ; correct use, 1970 ; use of μ, 960
Synchronization generator, for television, 1607
of oscillators, 3467
of valve generators, 2361
Synchrotrons, beam ejection, optimum disturbing field, 3232 ; for electron acceleration, improvement on betatron, 834 ; electron beam displacement, 832 ; magnetic field due to dee structure, (A) 1543 ; r.f. system, (A) 1165 ; stability of electron orbits, 494 ; theory, 1542

T

Tachometers, a.f., 2174
Telecommunication, handbook, (B) 323
Moscow conference, 1581
war-time, (A) 4094, in Belgian Congo, 870
Telecontrol (See also Control)
on h.v. networks, 2574 ; of missiles, 1100, 1171, 1172, (A) 1239, 2539, 2961, 2962, 3243 ; of model motor car, 2538 ; of receiver, 4040 ; use of dm waves, 1939 ; of V-2 rockets, 2886 ; of water-pumping station, 840
Telegraphy, developments, G.P.O., 1206, (A) 4024
hand key design, 1232, (A) 1950
radio, multichannel two-tone, 1212
Telemetry, on h.v. networks, 2574 ; radio, for aircraft flight testing, 1895, 2872 ; from V-2 rockets, 2536, 3242
Telephone, invention, controversy, 602
systems, transmission rating, 1208, (D) 3273
Telephony, American developments, (A) 530
carrier-current, basic principles, 4025
coaxial cable *vs* waveguides, (A) 1003
developments, G.P.O., 1206, (A) 4024
in noisy surroundings, 2663
telephone magneto design, 550
traffic intensity fluctuations, 869
Teletypewriter, airborne, 873, 2252
Television, (B) 3320
bibliography of R.C.A. papers, 1929–1946, 3301
carrier-difference sound reception, (A) 3315, 1612
channels, provision in London for the B.B.C., 2666
civic sales and servicing, 976
colour, 2958
electronic system, 1240, 1246, 3297
field tests, (A) 1239, (A) 3258
fundamental problems, 911
sequential *vs* simultaneous, 1602
transmitter for 490 Mc/s, 2592
Westinghouse system, (A) 1239, 3307
definition, 1237
vertical and horizontal, abac, 1600
and f.m., 2931
in France, (A) 270, (C) 2263 ; development and line standard, 1241 ; line standard, 2589
throughout France, 2588
fundamentals, 910
image quality and definition, 1954
interlacing, factors affecting, 2600
light-beam system, 1604
modulation measurement, 3593
plans, in Canada, 2266
progress in U.S.A., 4055
as public service, (A) 3300
reception, fading due to aircraft reflection, 923
tests in S. California, 552
relation to motion pictures, 912
relay system, tests, (A) 3298
u.h.f., 2586
simplified, (B) 924
simplified 250-line system, 3683
synchronization problems, survey, 2261, (D) 4048
synchronizing range, 4049
system, Bedford, 1601
for industrial applications, 2953
for naval airborne reconnaissance, 2960
technique, reproduction from negative film, 913
transmission networks, 3317
transmission, reflection calculation, 553, (A) 1236
unit for picture brightness, 67
in U.S.A., 2590
—— **apparatus**, aerial system for several receivers, 3029
aerials, for apartment buildings, 2955
load characteristics, 3303
rhombic, 26
for station WABD, 3432
transmission line measurements in design, 2262
airborne, Block and Ring systems, 2587
aircraft equipment, 3309
analysers, reduction of noise, 2964
c.r. tube, 1238, distortion measurement, 908
camera chain, portable, 3682
cameras, iconoscope, theory, 917, 2593
isoscope, 1244
mimo, i.e., miniature image orthicon, 2959
R.C.A. image orthicon, 555
counter-timer, (A) 3302
design standards, U.S.A., 286
developments, survey, 556
electron guns, 1968
h.v. power supplies, 3674, 4047
image dissector, e.s., (A) 1239, 3312
interstage auto-transformer, 1027
modulation test equipment, 808
mosaic for pickup tubes, 2957
pickup tubes, comparison with eye, 918
powdered iron in deflection circuits, (A) 1239, 3305, 3306
receivers, automatic frequency and phase control, 2599
construction, 2595, 3687, 4056, 4057
deflector coils, 1245, 1953
detector and video-amplifier circuits, 4058
e.m. deflection, (A) 2601
modernizing, 557
noise suppression, 274
post-war, (A) 2594
principal faults, 1608
projection, Philco, 2963
provision for choice of programme, 559
Pye, B16T, 919, 1611
R.C.A. models, (A) 3686, 3688
S.A.D.I.R., France, 1248
simple, 3313
simplified, Coudert, 2596
test equipment, 268, 1517
transmission lines for, 633
tuning unit, 3073
video detector circuits, 1610
scanning systems, 271, e.m. frame scanning, 272
screens, white, and I.C.I. colour system, (A) 4061
sound rejector circuits, 922
synchronizing-signal generators, 1607, 2507, 3489
test-pattern generator, 267
transmitters, for black-and-white and colour, (A) 1239, 3311
high-power, design, 3310
mobile, 3685
ultra-low-loss transmission-line feeder, 2667
valves, characteristics, 2293
various, 4050
—— **equipment**, high definition, 915
at Paris centre, 1606, 3684
R.C.A. relay link, 555
for reception, (B) 2268, (B) 2966, (B) 3689
—— **projection**, in cinemas, problems, 2264
in colour, for theatres, 3314
iconoscope and isoscope, 1243
large screen, 1609
oil film method, 554
patented systems, 914
perspective effects, 1242
plastic lenses for, 4052
R.C.A., system, 4054
survey, 4053
for theatres, 1247
—— **systems**, on single carrier wave, 263, (A) 264, 1598, 1599, (D) 2262
Temperature control, automatic, for furnaces, 490
low, measurement, by Brownian motion, (D) 2185, by thermal noise, 2863
phenomena at, 3847
production by He cryostat, 3495
Tenebrescence, radar applications, 2796
Tesla, Nikola, work on rotating fields and h.f. alternators, 2999
Test equipment (See also Cathode-ray oscillographs ; Servicing ; Signal generators; Signal tracers; and individual subjects)
for airborne radar, 188
for attenuation on v.h.f. transmission lines, (A) 2490
automatic circuit tester for mass production, 2181, (A) 2857, (A) 3196
c.r. tube for television transmitter modulation, 808
for fatigue tests, 3218
field laboratory to simulate home conditions, 228
for high-power valves, (A) 1258, 3335
impulse, for cables, 2848
for loudspeakers, 1312
microwave, 799, survey, 800
for mobile laboratory, 470
for repair workshops, 169
and techniques for airborne radar field maintenance, 2496
television, 267
for receivers, 268, 1517
sound channel, oscillator for, 2359
valve, 816, 1509, for pulses, 1858
10000-Mc/s waveguide test bench, 173
Testing, accelerated, of capacitor paper, 1498
of enamel-covered fine wire, 822
of high-power valves, (A) 1258, 3334
machine for tensile, compression, etc., tests, 2997
microwave radar, techniques, 478
non-destructive, 1844
overvoltage, of capacitors, 3575
of quartz crystals, 167
routine, by c.r.o., 809
of marine radio and radar equipment, specification, (B) 3667
of thermosetting plastics, 1865
in valve manufacture, advantages, 582
Thermal systems, and thermal inductance, 70
Thermionic cell, with positive emission, 593, 954
Thermistors, characteristics and applications, 3044 ; h.f., 766 ; properties and uses, 765, 3552
Thermocouples, radiation, sensitive high-speed, (A) 2843 ; various characteristics, 815
Thermodynamics, second law of, 695
statistical, (B) 1071
Thermoelectricity, properties of conductors, 3498
Thermopiles, Schwarz, 190
Thickness measurement, of organic layers on steel, 2533
Thunderclouds, application of Wilson's mechanism to, 2121
pressure fall below, 730
Thunderstorms, e.m. effects, 3907
Thyratrons, extension of life of, (A) 951
frequency performance, 1267
initiation of discharge, 1638
for motor control, 211
in parallel, 950
Raytheon RK61 and applications, 1637
Time control, for intervals of 0.1–100 sec, 3990, of photographic exposure, 200, of X-ray exposures, 3246
measurement, astronomical applications, 194
by electronic counter, for atomic particles, 2191
electronic decimal counter, 2190
electronic timer, 0.5–100 ms, 3568
millisecond chronoscope, (A) 1137, (A) 3964
of small intervals, by bridge methods, (A) 1852
Timebases, linear, 1040, 1383, generator for, 656, wide-range, 1711
Timekeeping, modern methods, (D) 3955
Timing circuits, pulse wave-front steepness in, 1032
Titanium, properties and extraction, 147
Tone control, at low volume levels, 621
Torque motor, with low-inertia armature, 247
Tower, microwave, 868
Tracking See Receivers, superheterodyne
Traction, powered by induction at 50 kc/s, 1153
Transducers, acoustic effects of marine fouling, 3399
electroacoustic, sensitivity and impedance, 2662
theory, 1990
electromechanical, (A) 2307, 3413, violation of reciprocity theorem, 370
Transformers, a.f., design, 2694, h.f. response, 1688
auto-, interstage, 1027
design, 3038, and theory, 893
h.f., use of permalloy tape, (A) 3162
impregnation for tropicalization, 133, (D) 134
matching, tuned-line, 624
measurement of no-load loss, 180
pulse, electromotive, 2690
quartz, for waveguide-output magnetrons, 2712
radar, steel for, 1834
toroidal, 3439
tuned, design of, 2342
wide-band, r.f., 3037
for X rays, oscillation damping, 1225
500 kc/s, for power line matching, 1370
Transient response, of filters, 48, (D) 662, (D) 2035
of loudspeakers, 1313
of tuned circuit, 1029
of video-frequency couplings, 671
Transients, measurement in l.v. circuit, 1845
recording of, 545
Transit-time effects, in valves, 1645
Transmission, electrical, steady-state, (B) 2054
f.m., from Alexandra Palace, 2241
measurement, equipment for communication circuits, 3181, (A) 3962
measuring set for 0.1 to 11 c/s, 2511
of signal along heterogeneous line, 1008
s.w., a.m. and f.m., 2236
—— **lines**, for broadcasting, 3022
calculation by matrix methods, survey, 1329
choice of aerial feeder, 3437
coaxial, comparator for, 3016 ; critical wavelengths, 3790 ; as oscillator, mode separation, 1332
delay, equalized, 41
diaphragms and junctions in, theory, 1323, (A) 1671
directional couplers for, 2007
exponential, 3023, 3792
field plotting, (A) 630
for f.m. and television receivers, 2330
generalized, equations for, 2004
h.f., 2672, 3791
impedance measurement, 2673
interaction between travelling wave and electron beam, 1330
introduction to, (B) 2018
non-uniform, voltage reflection coefficients, 2671
power reflection at junctions, 3783
reflection coefficient and s.w.r. measurement, 3968
as resonant circuits, 3424
steel towers for, (A) 250
tank circuit design, 2716
tapered, impedance matching, 1331
for television receivers, 633
transients, due to lightning, 625 ; theory, 3448
with undistorted parameters, theory, 635
uniform, propagation characteristics, 2670
v.h.f., attenuation tester, (A) 2490
water-dielectric, as r.f. generator load, 2493
3-phase, attenuation on, 2006
propagation along, 2005
8-wire, 3793
—— **systems**, microwave, for R/T, 1929
waveguide, 1326
Transmitter-receivers (See also Communication, mobile)
BC-645, 420-Mc/s, 1957
Transmitters (See also Broadcasting ; Communication ; Radar ; Television)
aircraft, R.A.F., type T.1154, 1618
amateur, 7–14-Mc/s, 70-W, 1619; Collins 30K, 927; 200-W, 928
bandswitching, 3.5–30-Mc/s, with single control, 929
BC-375-E, for amateur use, 930
BC-625, conversion to 144 Mc/s, 3696
broadcast, a.m., 250-W, 3323
B.B.C. synchronization improvements, 3897
f.m., 1624, 4060; experimental, 563; 3-kW, installation, 3694
dm λ, 50-W, 1621
f.m., 560
design, using cascade phase-shift system, 1617
mobile, 561
phasitron operation, 277
for 48-channel R/T link, 2606, 3705
for ground-air communications, 3325
low-power, for 1.8 and 3.5 Mc/s, 565
matching surfaces for, 1958
medium-power bandswitching, 276
miniature, 2602, radio mike, 3693
mobile, λ 10 m, 2968
output specification at u.h.f., 193
overmodulation splatter suppression, 1625, 3701
radar, 100-kW portable, 566
single-sideband, amplifier design, 3704
s.w., 1-kW, 1616
telephone-telegraph, type T.F.S.31, 1252
world list, 877
technical characterictics, effect on receiver design, 2911
telegraphy, s.w., type T-H.1343, 2603 ; 10-kW, 1615
λ 2 m, 3695 ; λ 6 m, 15-W, details, 2211 ; λ 10–80 m, with bandswitching, 3324 ; 1.7–28-Mc/s, 25-W, 1620 ; 3.5–30-Mc/s, 1-kW, 3326 ; 3-phase rotating field, for u.h.f., [illegible]
Travelling waves (See also Valves, travelling-wave)
interaction of guided wave and electron beam, 1999, 2003
production in waveguide, using black body concept, 2059
'**Tron**' glossary, 2302
Tropicalization, mould-prevention for radio equipment, 1826
of transformers and chokes, 133, (D) 134
Tropics, deterioration of materials in, 438
selection of component materials for, 2142
Troposphere See Atmosphere
Tuners, v.h.f., design, (A) 1026, 3265
Tungsten wires, electrolytic pointing, 3940
Tuning devices, band-spread, design, (D) 3072
mono-sequence, 3322
systems, inductance guillotine tuner, 2052
variable inductance, for television receivers, 3073

U

Ultra-high-frequency, engineering technique, (B) 618, (B) 1300
measurements, survey, (D) 1130
technique, survey, 282, 977
Ultrasonics See Supersonics
Units, absolute systems, 3842
in communications, 2508
decibel conversion chart, 1842
and dimensions, of e.m. quantities, 1392, 1733, 2383
electrical, absolute, date of adoption at N.P.L., 2834 ; change to absolute system, (A) 3956 ; International Committee of Weights and Measures new definitions, 2833

V

Vacuum technique, degassing of valves, 1260
developments, 2440
gauges, all-metal, 116
MacLeod, improvements, 1101
hermetic sealing, 1944
safety devices, 1103
survey, 742
vacuum lead in, 118
vacuum switch, 2946
—— **tubes**, beam-switching, cyclophon, (A) 1256

production methods for X-ray tube components, 2985
Valve circuits (See also Circuit theory ; Circuits, valve ; Equivalent circuits)
electrometer input, 1049
using pentagrids, 1063
thyratron, increase of power in, 1031
Valves (See also Gas discharge tubes ; Noise ; and special types)
alphabetic series, 2978
amplification factor, empirical formula, 3356
analysis of intermittent discharge, 940
application of principle of similitude, 3333
B8A base, 957, 3717, 3718, 4068, standardization, 980
characteristics, 3711
class-B amplifier, power measurement, 3578
control of current distribution, 3719
deflected-beam, for u.h.f., 936
development since 1920, 2615
diode, total emission damping, 3344
double-cathode, spontaneous fluctuations in, 953
effect of surface charge, 580
electrodes, substitute for nickel, (A) 2473
electrometer, stability, (A) 583, 1964
equivalent diode, 3345
filaments, Th-W, carburized, carbide structures in, 2614
flicker effect in, 935
fundamentals, (B) 306
gas, noise in, 2401
grid current in, 4075
grid electrodes, e.s. properties, 939
grounded-grid, technique and uses, 1965
h.f. currents in, theory, 579
high-power, production tests, (A) 1258, 3334
interelectrode capacitance measurement, 1134, 2488
ion emission from filaments, 744
manufacture, usefulness of electron diffraction tests, 2617
measurement, of dynamic mutual conductance, 3576
of grid emission, 2505
memory, e.s., selectron, (A) 3712
microphony, 3339
miniature, 3720
multi-reflection, 2628
oxide-cathode, anode current variations, 2289
space-charge currents, 3723
power, f.m. and television, and grounded-grid cavity circuit, (A) 3337
output of, 1261
tetrode, space-current division, 2625
u.h.f., data for, 2976
quality control, 1963
for radar i.f. amplifiers, 937
receiving, comparison table, 4069
life-testing for pulsed operation, 2485
rectifier, h.v., for X-ray diagnostics, 3708
resnatron, for 50-kW at u.h.f., (A) 1224, 3348
Russian, 2618
secondary emission suppression, 3713
Service equivalents, 1259
shot effect and amplifier output fluctuations, 2048
subminiature, electrometer, 2626
for television, characteristics, 2293
tester for, 816, portable, 1509
tetrode *vs* pentode for power amplification, 952
tetrodes *vs* triodes, (A) 3725
textbook for radio serviceman, (B) 594
transit-time, 1645
class-C operation, 2290
shot effect and receiving sensitivity, 1574
transmitting, evacuation, 1260
recent technical developments, 2616
triode, 50-kW water-cooled, 1634
for v.h.f. pulsed and c.w. operation, 2288
travelling-wave, 585, 586, 938, 1262, 1263, 4065
as amplifier, 2286
construction, 2285
helix circuit, 2339, 2340, 3036
internal field, (A) 3715
theory, 2284, 2974, (C) 4067, 3421, 4066
triode, amplification factors, 2621
characteristics, 3357
gas-filled, (B) 1275
interelectrode capacitances, 1501
medium-power, 600 Mc/s, 1635
microphony, 2981
for pulse power of 1 MW at 600-Mc/s, 2982
subminiature, microphony, (A) 3340
U.S.A., in the war, 2620
use of Zr, 1120
u.s.w., receiving and transmitting, 3714
v.m., 3353, current and power, (D) 2272
electron bunching, 1646, theory, 1627
electron debunching, 1272
lens effect of a.c. fields, 955
reflex, conversion efficiency, 2990
with wide tuning range, 2291
vibrotron, 2624, for microphone use, 584
voltage-regulator, characteristics, 2980
for voltage stabilization, 2277
VT-127-A in amateur transmitters, 925
Western European code for, 2977
Variations, cyclic, reality index for, 1496, (D) 2829
Varnishes, insulating, characteristics and manufacture, 444
Velocity measurement, of V-2 rocket by Doppler effect, 2512
Vibrations, asymmetrical, of cones, 1976
exciter for mechanical strength test, 1147, 2188
mechanical, measurement apparatus, 3217
Vibrators, cylindrical, h.f. radiation distribution, 3750
d.c./a.c. vibro-converter, 1945
principles and applications, 892
receiving, in waveguide, 3784
in rectangular waveguide, input resistance, 3789
Viscosity, of liquids, effect of electric field, 391
Visible speech, portrayal, (A) 3395
spectrograph, (A) 3396
use of c.r. tube, (A) 3398
use of phosphors, (A) 3397
Voice, artificial, for acoustic measurements, 3404
Voltage differentiation, circuits for, 30
doubling, CuO rectifiers *vs* thermionic valve, 2025
measurement, a.c./d.c. comparator for, 183, (A) 803 ; complex components, 1860 ; h.f., 1 μV, 1500 ; h.v., a.c., using electron diffraction, 2169 ; using sphere gap, 476
regulation, effective a.c. voltage, 2024
regulators, diode-controlled, 3440
Voltmeters, a.c., frequency compensated, 802
ellipsoid, for high voltages, 3584
high impedance, for iron testing, 1514, (D) 3583
peak, pulse, 3965 ; automatic slideback, 2176
stable, using compound feedback, 2500
valve, 1141, RCA audio, 1861

W

Water, change of state, electrical effects, 1780
drops, effect on atmospheric electrification, 1449
Wattmeters, for cm λ measurements, 1506
notch, for u.h.f. pulses, (A) 1139, 3195
u.h.f., 814, air-flow, 187
Wave mechanics, nonlinear wave equations of the quantum theory of the electron, 2726
physical interpretation, 1393
Wave propagation (See also Acoustics ; Sound)
acoustic and e.m., in waveguides, 1666
elastic, 1, in heterogeneous media, 2056, in piezoelectric media, 2057
of light, 689
of perturbation in dispersive medium, 3505
——, **e.m.** (See also Electromagnetic theory ; Ionosphere ; Television transmission)
and acoustic, in inhomogeneous medium, 847
in atmosphere, 3620
attenuation by rain at 1.25 cm λ, 2553
in curved circular waveguides, 2000, 3786
in curved rectangular waveguides, 1667, 3785
in curved waveguides, 16, 1005, 1320
diffraction round earth, 846
and dispersion, 2890
Doppler effect, 3254, (D) 4008
around the earth, application of phase-integral method, 2546
along earth's surface, theory, 1901, 1902
effect of moon, 2903
effect of sunspot cycle, 1420
ellipsoidal theory of, 2058
equivalent path and absorption, 3252
extension of Fresnel's formulae, 2887
guided waves in coaxial line, 2665
gyro interaction, 2897
of H_0 waves in waveguides, 2669
along heterogeneous line, 1008
and impedance concept, 218
in lattice structures, (B) 1907
in medium with non-uniform characteristics, 849
meterological factors, (B) 2906
microwave, normal-mode theory, 2211
sea echo, 2218
and solar eclipse of 9th July 1945, 2092, 2093, 2095, 2096
mode theory of tropospheric refraction, 2892
m.u.f. predictions, 1906
oblique reflection of very long waves from ionosphere, 2548
through obstacles in waveguides, 3780
within optical range, empirical formula, 1184
phase-integral methods, 3095
quasi-optical links, 2545
radiation angle variations, 3625
over radio spectrum, effects of solar activity, 2550
Sommerfeld's theory, 4007
s.w., a.m. and f.m., 2236
and s.w. links, 1210, 1211, (D) 3654
tests at 45.1, 474, and 2800 Mc/s, 3628
transatlantic, on 50 Mc/s, 1560, 2899
tropospheric, (A) 3634
tropospheric refraction, determination of eigenvalues of wave equation, 2893
between two semiconducting surfaces, 2889
u.h.f., 3256, in line of sight, 2549
use of C.R.P.L. charts for forecasting for amateurs, 2898
use of impedance concept, 3250
u.s.w., 4006
angle of arrival, 1182, 1183, (A) 4009
attenuation and scattering in atmosphere, 515
over bare ridges, (A) 509
effect of rain, (A) 1181
effect of weather, 516
explanation of field strength, (A) 512
extra-tropospheric influences, 402
importance of theory in development, 514
over land, and effect of obstacles, (A) 511
over land and sea, experimental data, 517, 518
mm λ, 1903
in non-uniform atmosphere, theory, 507
reflection from troposphere, (A) 1180
survey, 852, 1563, (D) 3633
theoretical field strength estimation, 510
v.h.f., surveys for mobile services, 3630
in waveguides, 3423, analysis, 506, mechanical analogy, 3844
world forecasts, 3253
for λ 5 m, (D) 3632, skip distance, 1561, (D) 3631, tropospheric influences, (A) 1178, 1179, 3255
for λ 10 cm and λ 3 cm in low-level ocean ducts, 2900
for λ 17–35 m, effect of magnetic fluctuations on velocity, 3251
Waveform, sawtooth, distortion correction, 558
nonlinearity correction circuits, 1040
and pulse, 2353
—— **analysis** (See also Fourier analysis)
apparatus for, 819
of forced vibrations with nonlinear restoring force, 53
of speech, 1982
Waveguides, (B) 359
attenuation, calculation, 1328, (A) 1674
and *Q* factor, 2328
coupler for, 3422
curved, circular, propagation in, 2000, 3786
propagation in, 16, 1005, 1320
rectangular, propagation in, 1667, 3785
cylindrical, with plane discontinuity, equivalent circuit, 634
diaphragms and junctions in, theory, 1323, (A) 1671
dielectric, for progressive-wave amplifier, 1317
directive couplers, 1007, 1359, (A) 1684
discussion on radiolocation convention papers, (D) 1322
e.m. and acoustic, of various shapes, 1666
filters in, 1673
frequency and dimensional data, 1319
λ variation by internal dielectric movement, 1321, (A) 1670
mechanical analogy for propagation in, 3844
matching problems, 1326
propagation in, 3423, analysis, 506
rectangular, with discontinuities, 1668, 1669
propagation modes, 15
reflection by disk in, 1006
resonant slots in, 1360, (A) 1685
resonant windows for vacuum seals in, 1231
rhumbatron switch, 1325, (A) 1672
for slow waves, (A) 3020
standing-wave meter, 1503
survey, 353
termination effects, 17
test bench for, 173
theory, applied to microwave propagation, 2211
theory of excitation, 2326
transmission in, and aerial systems, physical principles, (B) 2689
transmission of H_0 waves, 2669
various, attenuation curves, 1327
wattmeter for, 813
wave selectors for, theory and design, (A) 1004, 3019
Wavelength classification, 2650
Wavemeters, u.h.f., direct reading, (A) 3589
Waves, e.m., electric and magnetic vectors of, 3503, (D) 3864
guided, interaction with electron beam, 1999, 2003, 2325
plane, reflection by infinite set of plates, 2756, 3504
velocity measurement, 3249
Weathering, of light alloys, 1109
of Mg, accelerated tests, 1464
of thermosetting plastics, 1489
Welding, spot, capacitance-type welder, 3618
contact resistance in, (D) 772
control, 1896
small tools for, 551
Wind energy, harnessing of, 1286
velocity, measurement, at high altitudes, 109
Wire, Cu, manufacture and insulation, 756
fine, testing enamel insulation, 822
rubber-insulated, h.v. testing, (D) 3180
Th-W, determination of Th content, 751, 820
Wireless telegraphy, instruction handbook, (B) 326
Wiring, electrical, codes of practice, 1290
stamped, 3488

X

X-ray applications, analysis and inspection, (B) 1896 ; chemical identification by X-ray diffraction, 2884 ; inspection, 1890 ; measurement of Poisson's ratio, 2204 ; metal inspection, 1548
—— **tubes**, high-intensity, long wavelength, 2532
with point focus, 2203
with movable anticathode, 2205
X-rays, absorption measurement, 836, 2069, 3857
diffraction by free molecules, (B) 1749
equipment, 400-kV, for therapy, 3617
generators, 1000 and 2000 kV, 1547, (D) 3616
harm from exposure to, 973
super-voltage, physical properties of, 2864

Z

Z meter, 1142
Zirconium, properties and extraction, 147
use in valves, 1120

ERRATA

In "Abstracts and References" throughout the year

Abstract No.	65	In line 8 "thermon olecular" should read "thermomolecular"
,, ,,	106	Cancel the words "using a parabolic aerial array"
,, ,,	423	U.D.C. should read 621.396.11.029.64 : 535.434
,, ,,	655	,, ,, ,, 621.319.4 : 621.315.614.6
,, ,,	901	,, ,, ,, 621.352.8
,, ,,	1255	EM2 should read EM1
,, ,,	1399	U.D.C. should read 538.569.4.029.64 : 546.171.1
,, ,,	1485	,, ,, ,, 669.738 : 620.193.23
,, ,,	1578	,, ,, ,, 621.396.65
,, ,,	2218	,, ,, ,, 621.396.11.029.64 : 535.434
,, ,,	3584	0.3% should read 0.03%

* * *

Section III—1948

Index to

Abstracts and References

This section contains an index, listed separately by author and by subject, for all Abstracts and References published in PROCEEDINGS OF THE IRE from February, 1948, through January, 1949.

AUTHOR INDEX

AUTHOR INDEX—A name followed by "and" is that of the first author of a jointly written paper, while the word "with" indicates that the name indexed is that of the second author.

A

Abadie, P., dielectric loss at u.h.f., 2844; h.f. impedance measurement, 2001
Abbenhouse, R. P., c.r.o. for precision time measurement, (A) 2552
Abbot, A. E., graphical multivibrator design, 2748
Abbott, C. G., sun a regular variable star, (A) 94
Abelé, J., discontinuous relaxation oscillations, 2476
Abend, L., f.m. receiver alignment, 1137
Abragam, A., structure of waves of phase velocity c, 2718
Abraham, L. G., and others, pulse-echo measurements on cables, 2295
Abraham, W. G., loading of resonant cavities, (A) 682
Acker, J. T., factory tests on cathode nickel, (A) 2547
Ackroyd, J. O., speech communication in deafness or loud noise, 2690
Adam, M., miniature components and valves, 1092; phasitron modulator, 1495; sound recording by engraving on film, 1546
Adams, G. J., with A. Alford, reflection of television signals from tall buildings, (A) 2647
Adams, J. J., i.f. amplifiers for f.m. receivers, 527
Adams, P. R., S. H. M. Dodington and J. A. Herbst, tests on navar system, (A) 428
Adams, R. V., with others, mass and disintegration products of meson, 715
Adcock, W. A., computer for simultaneous and characteristic equations, 2834
Adirovich, E. I., luminescence of crystalline phosphors. 1373
Adler, R., f.m. detector valve, (A) 2475
—— with W. L. Cherry, Jr, piezoelectric effect in $BaTiO_3$ ceramics, 741
Aigrain, P. R., and E. M. Williams, amplitude-stabilized oscillators, pseudosynchronization in, 3044, theory, 980, 1883
Aiken, C. B., and W. C. Welz, d.c. amplifier for signals $<1\mu V$, 381
Aisberg, É., cathode-follower circuit, 994; negative-feedback circuits, 1606
Åkerlind, P., with S. Gejer, ionospheric investigations in Sweden, 9th July 1945, 1925
Albright, J. D. with M. A. Honnell, f.m. aerial patterns by means of models, 2462
Aldous, D. W., bibliography of magnetic recording, 944
Aldous, W. H., transmitting valves, 871
Alexander, F. E. S., anomalous radar propagation near New Zealand, 1969
Alexander, P., Industrial Applications of Ultrasonics, (B) 2567
Alexander, S. M., L. Marton and I. L. Cooter, visual observations of patterns recorded on magnetic media, (A) 2430
Alford, A., and G. J. Adams, reflection of television signals from tall buildings, (A) 2647
—— and H. Jasik, reradiation from broadcast towers, (A) 2443
Alfvén, H., granulation, waves, and heating of solar corona, 2786; magneto-hydrodynamic waves and sunspots, 3104, 3405
—— and H. Romanus, trochotron valve, 1205
Alixant, M., special valves, 2965
Allan, R., electrical engineering in India, (A) 1378, (A) 1658, 281
Allen, C. H., and I. Rudnick, high-power 3–34-kc/s siren, 917
—— H. Frings and I. Rudnick, biological effects of intense sound, 1533
Allen, C. W., solar noise at 200 Mc/s, (A) 1355
Allen, E. W., Jr, reflection of v.h.f. waves from meteoric ionization, 2328
Allen, J. F., low-temperature research in North America, 1619; phase-sensitive synchronous motor, 2641
Allen, J. S., electron-multiplier particle counter, 1106
Allen, L. H., ratio detector for a.m./f.m. reception, 2344
Allen, M., receiver noise factor, 1481
Allen, W. D., and J. L. Symonds, multiple-gap linear electron acceleration, 207
Allison, W., with others, measurement of ultra-short time intervals with chronotron, 762
Al'pert, Ya. L., anisotropy of ionosphere, 1032; sporadic F_1 layer, 1030, theory, 106
van Alphen, P. M., with others, home projection television, 2387
Alred, R. V., naval radar anti-jamming technique, 2532; Yagi aerials for 600 Mc/s, 2458
Althaus, E. J., with others, measurement of ultra-short time intervals with chronotron, 762
Anderson, A. R., electric expansion meter and applications, 1420
Anderson, C. D., and others, mass and disintegration products of meson, 715
Anderson, E. W., with others, Army wireless set No. 10, 2624
Anderson, R. E., with J. D. Seaver, quality control of permanent magnet alloys, 148
Anderson, R. S., with O. L. Angevine, Jr, sound distribution, 2704
Anderson, T. A., dynamic characteristics of probes, 3387
Anderson, W. P., and E. J. Grainger, communication equipment in British Navy, 2084
Andrew, B. L., thermistor in biological research, 500
Andrew. E. R., visibility of signals on radar c.r. tube, 2985
Andrew, V. J., spurious radiations from broadcast transmitters, 2654
Andrews, C. L., triode oscillator for λ 8 cm, 983
Andrews, D. R., with others, calibration of frequency records, (A) 2430
Andrews, J. P., thermoelectric power of CdO against Pt, 2266
Angevine, O. L., Jr, and R. S. Anderson, sound distribution, 2704
Anglade, C., with J. Terrien, addition law for Se photocell, 1201
—— with others, local sensitivity variations of photocells, 1814
Angwin, A. S., telecommunications in war, 2114
Anikin, V. I., with others, instruments for measurements at cm λ, 475
Anon.
  A.A. McK., common-carrier mobile R/T service, 1756; f.m. chain broadcasting, 830; fremodyne f.m. receiver, 2065; stereophonic sound, 3213
  —— and F.R., ultrasonic flaw detector, 1113
  A.H.M., telecommunications conference, Atlantic City, 1947, 1749
  B.F., and J.S., radio measurement apparatus, 2559
  B.G., shorthand circuit symbols, (D) 43
  "Cathode Ray", a.c. bridges, 2288; e.m. units, 75, (C) 1008; phase and its meaning, 2734; sidebands, 1197; synchrodyne, 3500; transformers, obvious and otherwise, 45; tuning circuits, 998
  D.G.F., bandwidth vs noise in communication systems, (AD) 1745; design trends for television transmitters, 1793
  E.A., l.f. analyser, 2003
  F.L.D., listeners' preferences, (D) 934
  F.R., pulse-code modulation, 1161
  —— with A.A. McK., ultrasonic flaw detector, 1113
  G.W.O.H., inventor of radiotelegraphy, 2429; Ohm and his law, 901; Popov, life and work, 1842; standard terms and abbreviations, 2428
  H. Sapiens, photoelectric track sound reproduction from film, 1541
  J.M., automatic pilot trans-Atlantic flight, 1037; New York-Boston microwave television relay, 1758
  J.S., with B.F., radio measurement apparatus, 2559
  M., anti-sonar, 1107
  M.J.A., h.f. induction and dielectric heating, 201
  Radionyme, Standard tests for components, 1899; standard tuning units and oscillators for 1948, 2088
Anton, N., radiation counter tubes, 2578
—— and M. Yudin, high-altitude rectifier valve, 2659
Antonov-Romanovskii, V. V., properties of alkaline earth phosphors, 1372
Antseliovich, E. S., u.h.f. detection, 1474
Apker, L., and others, wide-range double-heterodyne spectrum analyser, 769
Apple, E. L., 35-W midget transmitter, 2954
Appleton, E. V., F_2 ionization and geomagnetic latitude, (D) 1031; influence of tropospheric conditions on u.s.w. propagation, 2055; investigation and forecasting of ionospheric conditions, 2049; new metals for old, (A) 152
Arabadzhi, V. I., electricity of thunderstorms, 1961
Aram, N. W., aerials for f.m. receivers, (A) 237
Archer-Thompson, H., and E. M. Hickin, radio technique and apparatus for studying cm-λ propagation, 2028
Arditi, M., and V. J. DeSantis, thermionic emission from grids, (A) 2663
Arenberg, D. L., ultrasonic solid delay lines, 1578
Argoni, A., 50-kW f.m. transmitter for 88–108 Mc/s, 2655
Arkadiev, V., oscillations of elementary magnets, 706
Arley, N., magnetic field of rotating bodies, (D) 3108
Armstrong, E. B., plasma-electron oscillations, 2506
Armstrong, L. D., high-μ magnetometer for automatic steering control, 499
Armstrong, R. B., with G. L. Grisdale, design of communication receivers, (D) 1457
Arndt, W. F., with D. P. Loye, sheet of air-bubbles as acoustic screen, 2142
Arshinov, S. S., thermal compensation of circuits, 3041
Arzinger, A., H. E. Hallborg and J. H. Nelson, sunspots and radio weather, 3106
Aschen, R., band-modulator receiver, 1730; sensitive wavemeter, 186; television projection, 1787
—— and R. Gesnand, l.f. panoramic analyser, 2002
—— and J. Goutelle, h.f. beat-frequency oscillator, 1584
—— and R. Zahl, beat-frequency oscillator construction, 369
Aschenbrenner, R., alignment of a.m./f.m. generator, 1091; receiver alignment with panoramic analyser, 1096
Ashauer, S., self-accelerating electron, 703
Ashwell, G. E., with B. G. Pressey, pulse field-strength measuring set for v.h.f., 1684
Ashworth, F., W. Needham and R. W. Sillars, SiC nonlinear resistors, (D) 3367
Asplund, A., with others, impact testing of plastics, 1065
Astbury, N. F., calibration of hydrophones and crystal transceivers, 2434; moving-coil galvanometer as circuit element, 3366
Aston, G. H., and L. Essen, frequency measurement at 10000–50000 Mc/s, 2015
Aten, A. H. W., Jr, with others, effect of degassing procedure on oxide cathodes, 2415
Atlas, D., radar analysis of rainstorms, (A) 2524
Atterling, H., and G. Lindström, h.f. cyclotron generator, 2874
Attree, V., reducing fly-back time of Miller timebase, 2749
Attree, V. H., low-impedance d.c. stabilized power supply, 3529
Auerbach, I. L., and others, Hg-delay-line memory (A) 2475
Aughtie, F., synchrodyne receiver, (D) 1139
Austen, A. E. W., with others, voltage characteristics of polythene cables, (D) 2841
Averkov, S. I., with others, instruments for measurements at cm λ, 475
Avery, D. G., and R. Witty, diffusion-pump theory, 2257

B

Bacchi, G., radiation pattern of cylindrical radiator with conical reflector, 2997
Bach, H. M., Jr, television interference, 3537
Baggott, A. J., and C. H. Fawcett, magnetic and acoustic mine development, 790
Bailey, F. M., tuning indicator for f.m., 834
Bailey, H. C., electronics in the Antarctic, 259
Bailey, R. S., and H. E. Singleton, reducing transmission bandwidth, 3539
Bainbridge-Bell, L. H., improving circuit diagrams, 2737
Baker, G. T., indicator for electronic counters, 2307; nonlinear resistors for voltage correction, 1169; portable electronic chronometer, 3165
Baker, G. W., design of hearing-aid valves, (A) 2430; two-terminal h.v. rectifier valve, (A) 2663
Baker, W. N., standing-wave indicator for 3–22 Mc/s, 2300
Baker, W. R., J. V. Franck and J. D. Gow, linear accelerator oscillator and coupling system, (A) 2318
Bakker, J., with F. A. Kröger, luminescence of Ce compounds, 3425
Baldinger, E., and P. Huber, resolving power of counter tubes, 1424
Ballam, J., with others, Berkeley 4-MeV e.s. generator, (A) 2311
Ballantine, R. J., and E. G. James, wide-range u.h.f. oscillator circuits, 2373
Ballard, R. C., with others, experimental simultaneous colour television system, 572
Ballard, W. C., Jr, transmission-line vector diagram, (A) 2443
Ballou, B. O., with others, KSBR 50-kW 100.5-Mc/s f.m. transmitter, 592
Balls, A. W., with others, high-power pulsed magnetron development, 892, (D) 3566
Bamford, H. S., multi-gun c.r.o., 3184
Bane, C. F., double-tuned r.f. preamplifier, 1314
Banerjea, B. K., with others, ionospheric propagation of e.m. waves, 1442; microwave radiation from sun, 2229
Banerjee, S. S., and R. N. Singh, F_2-layer electron density near equator, 2239
Bann, J. J., quartz-controlled signal generator, 1097
Baños, A., Jr, H. Gruen and D. S. Saxon, propagation in 2-dielectric coaxial lines, (A) 2166
Banthorpe, C. H., h.v. supply for television receivers, 286
Banting, H. de L., transitron oscillator, 2485
Banwell, C. J., with others, radio echo observations of meteors in 1946, 2778, 2780
Baracket, A. J., abac for pulse rise time response, 2492; square-wave response abac, 62
Baral, S. S., S. N. Ghosh and M. Debray, abnormalities in F region at Calcutta, 2522
Baranger, M., and F. Netter, quantum theory, second quantification, 1615
Baranov, N., bridged-T networks and applications, 1295
Barbee, B. C., superheterodyne for 144 Mc/s, 810
Barber, N. F., positive and negative frequencies, (D) 1867
Bardeen, J., with W. H. Brattain, forward current in Ge rectifiers, 3429
Bardsley, W., with S. Tolansky interferometry for study of quartz oscillations, 3400
Barducci, I., theory of electromechanical transducers, 1898
Barfield, R. H., and R. E. Burgess, small aerials in dielectric media, 3351
Barford, N. C., and M. Bowman-Manifold, theory of v.m. valves, 894
Bargellini, P. L., broadcasting in Italy and f.m., 1759
Bark, A., with others, instantaneous radio audience-measurement system, (A) 2430
Barker, A. C., single-diaphragm loud-speakers, 2702
Barker, H. J., with D. P. J. Retief, SOJ-12 open-wire carrier telephone systems, 2610
Barlow, E. J., Doppler radar, (A) 2524
Barlow, H. M., Micro-Waves and Wave Guides, (B) 1564; trunk waveguide multichannel communication, 257
Barr, E. E., with others, Ni bolometers, 194
Barraud, J., with J. J. Trillat, measurement of peak voltages by electron diffraction, 166
Barstow, J. M., rural carrier telephony, 2612
Barta, I., twin-T and bridged-T circuits, 1576
Bartelink, E. H. B., and F. Dasham, f.m. short-range carrier system, 1152
—— J. Kahnke and R. L. Watters, flat-response single-tuned i.f. amplifier, 2496
Bartell, W., with E. Harrington, f.m. adapter for a.m. receivers, 1456
Barthélemy, R., properties of thin slightly-conducting targets, 1777, 1778
Barthon, J., video amplification, 1189
Barwick, W. J., and C. J. Fowler, extending frequency range of noise meters, (A) 2552
Bartlett, A. C., geometry of rectangular waveguides, 2722
Bartlett, J. G., and G. T. Davies, high-speed oscillographs, 1690
Bassi, P., and A. Loria, scale-of-10 counting circuit, 2185
Bast, G. H., D. Goedhart and J. F. Schouten, 48-channel carrier telephone system, 2356
Batcher, R. R., pulse-code modulation for telephony, 258
Bate, A. E., and M. E. Pillow, mean free path of sound in auditorium, 2
Bates, D. R., origin of night-sky light, 1642
—— and H. S. W. Massey, recombination in atmospheric ionized layers, 1944
—— with S. Chapman, aurorae and night-sky light, 730
Bates, L. F., and E. G. Harrison, temperature changes in magnetization, of iron, 2805, of some alloys, 2804
Bauchman, R. W., with others, 3-cm and 9-cm propagation in low ocean ducts, 521
Bauer, J. A., television receiver test equipment, 780; u.h.f. wide-band sweep generators, 487
Baum, R. F., approximations to impedance functions, 3040
Baumgartner, J., band spreading by double heterodyning, 2898
Baurand, J., and R. Lambert, pulse method for measurement of small photo-currents, 1672
Baxandall, P. J., high-quality amplifier design, 1328
Bay, Z., and G. Papp, coincidence circuit with high resolving power, 2471
Bayliff, R. W., with others, meteor whistles, 3403
Bays, C. F., and D. Slater, hermetic sealing of transformers, 749
Beach, R., e.s. ills and cures of aircraft, (D) 812
Beam, R. E., with A. B. Bronwell, Theory and Application of Microwaves, (B) 2682
Bean, N. S., with J. H. Roe, television field equipment, 2389
Beard, E. G., formulae for negative feedback, 1327; frequency modulation, 1496; high-gain phase-splitting circuit, 1603; i.f. transformers for a.m./f.m. receivers, 1732; noise reduction, in amplifiers and mixers, (A) 1600, at u.h.f., (A) 1592; oscillating valve circuits, 1585; Philips Manual of Radio Practice for Servicemen, (B) 2675; random noise in radio receivers, 1483; station selection with f.m. receivers, 1467; switch *vs* tone-control for receivers, 1477
Beattie, A. H., receiver chassis testing equipment, 163
Beatty, R. T., Radio Data Charts, (B) 3285
Beaumont, D. W., with others, single crystals of $BaTiO_3$, (A) 125
Beauvais, G., recent researches on insulating materials, 2819
Beck, A. C., and D. H. Ring, testing with circulated pulses, 777
Beck, A. H., and S. A. Tibbs, automatic polar diagram recorder, 1400
Bedeau, F., circuit response to sawtooth e.m.f., 1872
Bedford, L. H., gun-laying radar receivers, 733
Begun, S. J., bias-field distortion in magnetic tape recording, (A) 2430
Behr, A., large chromospheric eruption, 3107
Beitman, M. N., Most-Often-Needed F.M. and Television Servicing Information, (B) 3076; Most-Often-Needed 1947 Radio Diagrams and Servicing Information, (B) 256
Belevitch, V., insertion loss and phase shift of filters, 384; linear theory of bridge and ring modulator circuits, 3058
Belin, R. E., measurement of atmospheric potential gradient, 1674, 2840
Belinfante, F. J., e.m. field theory, 3078, 3088
Belkin, M. K., stabilization of superregenerative receiver, 3234; superregenerative reception of pulse signals, 1737
Bell, D. A., choice of frequency for v.h.f. radio links, 3518; intensity-distance law of radiation, 2592; slot aerials, 1263; thermal noise in resistors, (C) 3239; vibrator power packs, 3528
Bell, J., data-transmission systems, (A) 829
—— and others, u.s.w. triodes and oscillators, 683
Bell, P. R., with W. H. Jordan, linear amplifier, 991
Belyaev, B. V., effect of frequency variations on voltage stabilizers, 3255
Bender, J. H., cathode-coupled converters, 240
Beneš, J., with V. Petržilka, crystal cuts determined by X rays, 144
Benfield, A. E., with others, ultrasonic delay lines, 2479
Benjamin, R., blocking oscillators, 977
Bennett, F. D., with J. S. Brown, matrix equations for triode circuits, 3043
Bennett, W. R., sum of vectors of random phase, 3164
Bennett, W. S., with others, frequency stabilization of microwave oscillators by spectrum lines, 2180
Bennington, T. W., ionosphere review, 1947, 1360; ionospheric-propagation forecasting, 2386; propagation at 40–100 Mc/s, 1478
Benoit, J., omnidirectional slotted aerial for cm λ, 957
—— and L. Fouquet, capacitor for measurement of dielectric constant of liquid, 2554
Benson, J. E., and W. A. Colebrook, telecontrol of receivers for aircraft communication, 275, 2836
Bentley, N. H., with W. I. Flach, high-quality home-made television receiver, 577
Bens, F., negative feedback, 1604
Benzer, S., electrical oscillations in Ge crystals, (A) 138; excess-defect Ge contacts, 1380
Beranek, L. L., sound attenuation in multiple partitions, (A) 2141; speech intelligibility for communication systems, 323
Berg, W. F., optimum operating conditions for gas-tube voltage regulators, 563
Berger, K., lightning research in Switzerland, 110
Berhley, F. E., tuning without capacitors, 389
Berkner, L. V., with others, Ionospheric Research at College, Alaska (B) 2786
Berman, L. M., direct-reading superheterodyne frequency meter, 3186
Bernhardt, J., receiver alignment by c.r.o., 184
Bertein, F., electron lenses, aberrations of form, 1123, defects and image sharpness, 1126, corrector system for, 1122
—— H. Bruck and P. Grivet, resolving power and objective defects in electron microscope, 214
Bertram, S., degenerative positive-bias multivibrator, 1884
Bertrand, S., cathodyne dephasing, 58
Besle, C., measurements of tracing speed of c.r. spot, 3185
Bess, L., and A. O. Hanson, electron current in 22-MeV betatron, 2586
Besson, R., distortion meter, 191; h.v. supply for television c.r. tube, 1183; trouble chasing with the c.r.o., 1089
Best, A. C., standard radio atmosphere, 2045
Best, N. M., television aerials, (D) 956
Besterman, T., British Sources of Reference and Information, (B) 3284
de Bettencourt, J. T., with H. Klemperer, repeller storage tube, 3569
Bettinger, H., Television Techniques, (B) 584
Beurtheret, C., broadcasting transmitter, 50 W, Type T.H.1163, 2096; 20 kW, Type T.H.1392, 2956
Beutler, F., sound distribution system, with programme selection, 327
Bevan, N. T. J., and L. Grimshaw, amateur R/T on 2350 Mc/s, 3248
Bevan, P. A. T., applications of h.v. Hg-arc rectifiers, (D) 560
—— with others, parallel operation of high-power broadcasting transmitters, 3540
Beyer, R. T., magnetic amplifiers in computing circuits, 158
—— with others, magnetic amplifiers, 664
Beynon, W. J. G., meteor observations, 228
Bierwirth, R. A., with others, Radio Frequency Heating, (B) 221
Bigelow, J. F., scanning generator and h.v. supply unit, 1774
Biggs, J. A., with others, aircraft instrumentation and control, (A) 2524
Billings, B. H., E. E. Barr and W. L. Hyde, Ni bolometers, 194
Bingley, F. J., projective geometry and television colour mixture, (A) 2647, 3259
Binnian, W., with others, 3 cm and 9 cm propagation in low ocean ducts, 521
Birks, J. B., mechanism of ferromagnetic dispersion, 1064; permeability of low-conductivity materials at cm λ, 2807
Bishop, H., war-time activities of B.B.C. Engineering Division, 2086, (D) 3525
Bishop, P. O., with E. J. Harris, electro-encephalograph amplifier, (D) 1128
Bishop, W. S., synthetic hard rubber, 2542
Black, F. W., with R. C. Robbins, crystal rectifiers for measurements, 1770
Black, H. S., and J. O. Edson, pulse-code modulation, (A) 2363
Blackband, W. T., and D. R. Brown, measurement of cable constants at 3000 Mc/s, 1997
Blackwell, D. E., O. Simpson and G. B. B. M. Sutherland, PbSe photocells, 1815
—— with others, PbS photocells, 2660
Blanc-Lapierre, A., and R. Fortet, stationary aleatory functions, 1666
—— and P. Lapostolle, fluctuations in quasi-sinusoidal quantities, 77
Bleaney, B., electronic tuning of reflex klystrons, 2110; r.f. power measurement by bolometer lamps at cm λ, 2025
—— and J. H. N. Loubser, collision broadening in NH_3 inversion spectrum, 3100
—— and R. P. Penrose, inversion spectrum of NH_3, pressure broadening,

1916, collision broadening, 3397
—— J. H. E. Griffiths and D. Roaf, signal generators for cm-λ noise-factor measurements, 2926
—— J. W. Ryde and T. H. Kinman, Si-W crystal rectifiers, 687
Blewett, J. P., design of air-core synchrotron, **1432;** electron trajectories by differential analyser, **2408;** magnetic field of air-core coils, [illegible]
—— and J. H. Rubel, coaxial delay lines, **1287**
—— with W. C. Hahn, electron trajectories by differential analyser, **2408**
Bliss, W. H., μs recorder and timer, **763**
Bloch, A., direct calculation of harmonic output and intermodulation products, **2205**
Bloch, L., L. de Broglie's theory of light, **1616**
Blodgett, K. B., with R. L. Green, electrically conducting glasses, **3437**
Bloecker, W. E., interconnection facilities for television broadcasting, **846**
Blom, B., military requirements for printed circuits, **(A) 1614**
Blondé, R., and P. Herreng, high-speed level recorder, S.A.C.M. Type 2128, **1080**
Bloom, A., with V. W. Cohen, microphony in subminiature triode, **3556**
Blow, T. C., graphical Fourier analysis, **1067**
Bode, H. W., Network Analysis and Feedback Amplifier Design, **(B) 3381**
de Boer, F., conductivity of Se crystals, **2809**
Boers, C. J., amplifier for c.r.o., **1595**
Boesch, W., telemetry, **501**
Bohm, D., and L. L. Foldy, synchro-cyclotron, **793**
Bol, K., with L. Marton, spherical aberration of compound magnetic lenses, **216**
Bolt, R. H., perforated facings for acoustic materials, **931**
Bolton, J. G., and G. J. Stanley, r.f. radiation from constellation of Cygnus, **2514**
—— with others, solar radiation, v.h.f., **711**
Bomberger, D. C., loudness control for reproducing systems, **3380**
Bondi, H., F. Hoyle and R. A. Lyttleton, structure of solar atmosphere, [illegible]
Bondley, R. I., Ti technique for glass/metal seals, **(A) 2800**
Bonner, H. M., proximity fuse, **219**
Booker, H. G., impedance concept and wave propagation, **(D) 3491**
Boonimovich, B. (See also Bunimovich), noise in nonlinear system, **1480**
Boord, K. R., h.f. allocations, Atlantic City, 1947, **1492**
Boot, H. A. H., and J. T. Randall, cavity magnetron development, **890, (D) 3564**
Booth, C. F., and G. Gregory, comparison of standard frequencies and Doppler effect, **1723**
—— and F. J. M. Laver, standard of frequency and applications, **(D) 2277**
Boothroyd, A. R., with others, electrolyte tank for a.c. field distributions, **3459**
Bordoni, P. G., and D. Sette, capacitance meter with quartz resonance indicator, **(A) 2289**
Borg, H., with others, u.h.f. mobile and fixed communication, **2081, (D) 3514**
Borger, R., with T. G. Cowling, conductivity of D layer, **3116**
Borrow, R. L. A., with C. Matthews, mutual interference in ships of the Royal Navy, **2348**
Borup, A., circuit breaker for instrument protection, **1763**
Borzyak, P. G., with others, Sb-Cs cathodes, **3550**
Bosley, W., with others, G-M counters, **2032**
Boswell, I. L., with others, dielectric residual effects in titanates, **2263**
Böttcher, F., nonlinear distortion in low-frequency transformers with strong premagnetization, **3035**
Bouchard, J., thermoelectric power of ferromagnetic materials, **3090**
Boucherot, E., with others, 12-channel carrier-current system, **1489**
Bourne, W. A., with others, 3-cm spectrometer and mismatching impedance unit, **2017**
Boursault, P. A., R.C.A. AR-88D receiver, **2335**
Bousky, S., electronic balancing of gyroscope rotors, **203**
Bouthillon, L., applications of Laplace and Cauchy transforms, **458 ;** theory of quadripoles, **2191**
Bouwkamp, C. J., aerial radiation resistance, **2729;** input impedance of vertical λ/4 aerial, **2173;** singularities at sharp edges in e.m. diffraction theory, **2772;** tabulation and application of new transcendental function, **3258**
—— and N. G. de Bruijn, e.s. field of point charge inside cylinder, **78;** optimum aerial-current distribution, **2730**
Bovey, D. E., bridge for testing hardness and composition, **1111**
Bowdler, G. W., peak voltage measurement at 600 Mc/s, **2286**
Bowers, D. F., and B. F. Cranston, Trader and Oceanspan marine transmitters, **2387**
Bowie, R. M., negative ion blemish in c.r. tube, **(A) 2663**
—— and A. E. Martin, spectral power distribution of phosphors, **3426**
Bowlus, O. E., and P. T. Nims, thyratron frequency changers, **2178**
Bowman-Manifold, M., with N. C. Barford, theory of v.m. valves, **894**
Boyer, K., selective detector for charged particles, **(A) 2574**
Boyers, J. S., frequency response and distortion in magnetic recording, **3332**
Boyle, H. G., and E. B. Dell, compact projection television system, **2651**
Boyle, R. J., Australian broadcasting, **1760**
Bracewell, R. N., abacs for resonant frequencies of cavities, **48**
Bradfield, G., new electro-acoustic transducer, **2701**
Bradford, C. L., printed vitreous-dielectric capacitors, **(A) 1614**
—— B. L. Weller and S. A. McNeight, printed vitreous-enamel components, **1003**
Bradley, W. E., theory of superregenerative receiver, **(A) 2596**
—— and E. Traub, Philco television projection system, **295,** receiver for, **578**
Bradner, H., and others, design of Berkeley linear accelerator, **(A) 2316**
Bradshaw, E., and others, h.v. measurements, **(A) 2561**
Brailsford, F., eddy-current anomaly in sheet steels, **1977**
Branson, N. G., portable ultrasonic thickness gauge, **1702**
Brattain, W. H., and J. Bardeen, forward current in Ge rectifiers, **3439**
Brande, B. V., turnstile aerial for television, **2093**
—— I. M. Rushchuk and M. M. Pruzhanski, tower aerials for broadcasting, **26**
Brande, S. Ya., effect of external e.m. field on split-anode magnetron, **610**
Brauer, P., mixed alkali phosphors with mixed activators, **3128**
Bray, T. E., J. C. Eaton and J. W. Whitehead, impedance-matching transformer, **1296**
Bray, W. J., and W. R. H. Lowry, testing of communication receivers, **2298, (D) 3470**
—— H. G. Lillicrap and W. R. H. Lowry, transmitter drives and receivers for single-sideband systems, **2395**
—— H. G. Lillicrap and F. C. Owen, fading machine, **2299**
Breckenridge, R. G., with others, ceramic sheets for capacitors, **146 ;** single crystals of $BaTiO_3$, **(A) 125**
Brekhovskikh, L., spherical waves from plane boundary, **2773**
Bremmer, H., ray theory of propagation of radio waves round spherical earth, **513**
Brenet, J., polarization of electron waves, **391**
Brennand, R., variable frequency s.w. diathermy, **1108**
Brenta, R., Cosmo Compo receiver, **2337**
Bressi, A., frequency divider, **1885**
du Breuil, F., with others, 100-kc/s magnetostrictive transducer, **(A) 3329**
de Brey, H., and H. Rinia, air cooling of transmitting valves, **2673**
Brian, W. S., audio output tetrode, **608**
Bricard, J., ionic equilibrium of the lower atmosphere, **2792**
Bridgewater, T. H., television outside broadcast service, **841**
Briggs, B. H., with others, p.p.i. circuits, **1005**
Briggs, G. A., Loudspeakers ; The Why and How of Good Reproduction, **(B) 3333**
Briggs, T. H., European manufacture of cathodes, **(A) 2663**
Brillouin, L., interaction of waves and electrons, **3093**
Brinkworth, L. L., with H. J. H. Nethersole, steel-bulb Hg-arc rectifier, **2372**
Briton, J. N., British and American technical developments, **624;** light-weight radar in Australia, **1044**
Britton, R. G., Electronic Developments, **(B) 228**
Broadway, L. F., and others, v.m. valves, **896**
Brockbank, R. A., with R. F. J. Jarvis, multichannel r.f. amplifiers, **2213**
Brockway, W. W., with D. G. Shearer, radiovisor landing system for aircraft, **(A) 2524**
de Broglie, L., electron optics, **3484;** frequency and phase velocity in wave mechanics, **76;** Max Planck, **1841;** propagation in waveguides, **1251**
—— (Ed.), Almanach des Sciences, 1948, **2674, (C) 3571**
Bronwell, A., c.r. tube for colour television, **2937**
Bronwell, A. B., and R. E. Beam, Theory and Application of Microwaves, **(B) 2682**
Brooks, R. D., with C. E. Hallmark, wide-band oscilloscope amplifier, **64**
Brown, A. H., and H. M. Stanier, v.h.f. aerials for short distances, **3340**
Brown, D., and J. W. Lyttleton, photoelectric Fourier transformer for analysing sound films, **2482**
Brown, D. R., with W. T. Blackband, measurement of cable constants at 3000 Mc/s, **1897**
—— with N. Rochester, rectifier networks for multi-position switching, **(A) 2475**
Brown, E. B., detecting short-circuited turns in coils, **3378;** polar a.c. ammeter, **1084**
Brown, F. W., mobile f.m. system, **827**
Brown, G. H., J. Epstein and D. W. Peterson, v.h.f. television propagation measurements, **3224**
—— C. N. Hoyler and R. A. Bierwirth, Radio-Frequency Heating, **(B) 221**
Brown, H. J., airline communications and navigation, **426, (D) 1038**
Brown, J. S., materials and components for transmission line installation, **1176, 2381**
—— and F. D. Bennett, matrix equations for triode circuits, **3043**
Brown, J. T. L., and C. E. Pollard, Hg-contact relays, **(A) 2374**
Brown, R. H., harmonic amplifier design, **61, (D) 1888**
Brown, R. L., with others, acoustic impedance of surfaces in water, **920**
Brown, S. C., and W. W. Miller, CO_2-filled G-M counters, **783**
—— with M. A. Herlin, breakdown of gas at microwave frequencies, **3390**
Brown, V. A., and B. P. Ramsay, Maxwell bridge at periods 1–200 sec, **(A) 182**
Brown, W., television interference, **3533**
Brownlow, J. M., with others, ceramic sheets for capacitors, **146**
Bruce, A., with others, p.m. signal generator for 260–800 Mc/s, **1697**
Bruce, F. M., ellipsoid voltmeter for high a.c. voltages, **(C) 478, (D) 2849 ;** spark-gap calibration for h.v. measurement, **(D) 2850**
Bruck, G. G., frequency stabilization of reflex oscillators, **1569**
—— and E. R. Wicher, slow TM waves in cylindrical guides, **334, 1555**
Bruck, H., and P. Grivet, improvements in C.S.F. e.s. microscope, **212**
—— R. Remillon and L. Romani, aberration of e.s. lens, **2040**
—— with others, resolving power and objective defects in electron microscope, **214**
de Bruijn, N. G., with C. J. Bouwkamp, e.s. field of point charge inside cylinder, **78 ;** optimum aerial-current distribution, **2730**
Bruining, H., with others, effect of degassing procedure on oxide cathodes, **2415**
Bruk, I. S., electrical differential analyser, **1070;** equivalents for circuits with periodic parameters, **959**
Brunetti, C., printed-circuit applications, **(A) 1614**
—— and R. W. Curtis, printed-circuit techniques, **1894**
Brunner, F., extending linear range of reactance modulators, **2657**
Brylinski, E., systems of electrical units, **3077**
de Buccar, M., silicone rubbers, **2820**
Buchanan, I. P., electronic instruments for thermometry, **2869**
Buchholz, H., effect of junctions on waveguide field, **3018**
Buchmann, G., absolute calibration of microphones, **919**
—— with others, sound absorber and sound-damped room, **6**
Buckingham, W. D., C. R. Deibert and R. V. Morgenstern, concentrated-arc lamp for light-beam communication, **585**
Budeanu, C., rationalization of units and e.m. formulae, **1006**
Budenbom, H. T., waveguide hybrid rings for microwaves, **(A) 2443**
Buechner, W. W., and others, e.s. accelerator for electrons, **1120**
—— with others, e.s. generators, **3483**
Bull, C. S., diode as a.c. voltmeter, **767;** space-charge effects in beam tetrodes, **2668**
Bull, G. A., errors in refractive index measurement, **1941**
Bull, R. L., with D. W. Glover, silicones, **1056**
Bullard, E. C., with L. B. Slichter, Frenkel's theory of geomagnetism, **(D) 104**
Bullington, K., propagation for λ <10 m, **802**
Bundy, F. P., laminated magnetostrictive oscillators, **(A) 3328;** stepped-frequency transducer elements, **2699**
Bunimovich, V. I., and M. A. Leontovich, large deviations in electric fluctuations, **1213**
Bunting, E. N., with others, Ba-Mg titanate dielectrics, **3441**
Burbank, C. J., measurement of directivity factor, **(A) 2131**
Burcham, W. E., 1-MeV accelerating equipment of the Cavendish Laboratory, **2037**
Burdett, G. A. T., future trend in component design, **625**
Burdick, R. H., constant-voltage transformers for radio power supplies, **282,** 1173
Burgess, E., German guided and rocket missiles, **1130**
Burgess, R. E., impulse response of diode voltmeter, **2736;** partially-screened open aerials, **(D) 659**
—— with R. H. Barfield, small aerials in dielectric media, **3351**
—— with W. Ross, design of H-type Adcock direction finders, **2538**
—— with H. A. Thomas, Radio Research Special Report No. 15 : Radio Noise, **(B) 534**
Burks, A. W., computing circuit of ENIAC, **158**
Burland, M. S., with others, observations of 1947 Perseid meteor shower, **2511**
Burmeister, F., data for 1945 magnetic deviation chart, **3111**
Burnside, D. G., with others, pulse triode for 200-kW at 600 Mc/s, **2668**
Burrell, C. M., W. R. Savery and P. B. F. Evans, alignment signal generator with display, **1695**
—— with C. W. Oatley, u.h.f. filters, **1612**
—— with L. W. Shawe, direct-reading cm-λ wavemeters, **2018 ;** Q-meter for 10-cm echo boxes, **2005**
Burrill, E. A., with others, e.s. accelerator for electrons, **1120**
Burtner, R. L., with others, stereoscopic viewing for c.r. tubes, **2984**
Burton, C. J., ultrasonic velocity and absorption in liquid mixtures, **2128**
Burwen, R. S., feedback preamplifier for magnetic pickups, **1608**
Bush, R. R., with J. S. Donal, Jr, a.m. of magnetrons, **(A) 2663**
Busignies, H., and M. Dishal, characteristics of navigation and d.f. systems, **(A) 430**
Buss, R. R., stable regulated power supplies, **(A) 2639**
Bussat, R., abacs for superheterodyne oscillatory circuits, **1473**
Butement, W. A. S., B. Newsam and A. J. Oxford, precision radar, **1962**
Butler, F., reactance-modulator theory, **1569**
Butler, F. E., mass production of iconoscopes and kinescopes, **1505**
Butler, K. H., fluorescence of silicate phosphors, **2258**
Butler, O. I., and C. Y. Mang, laminated magnetic cores, effects of overlapping joints, **1978,** magnetic properties, **1979**
Butterfield, F. E., transmitter interference due to coupled aerials, **2906**
Butterworth, A., buried metal detection, **(A) 2882;** recording magnetometer, **472**

C

Cabannes, J., and J. Dufay, spectrum of night-sky in blue and violet, **2523**
Cady, C. A., frequency and modulation monitor, **2291, 2571**
Cady, M., mountain-top f.m. transmitter installation, **268**
Cagniard, L., measurement of atmospheric ionic conductivity, **2556**
Calinicenco, N., magnetic inclination at Jassy, 1941–1947, **1934**
Calpine, H. C., with others, naval fire-control radar, **(D) 732**
Calverley, T. E., with others, Van de Graaff e.s. generator, **3258**
Calvert, R., h.f. bridges, **1410**
Cambi, E., theory of variable resonant circuit, **1875**
Camilli, G., and J. J. Chapman, gaseous insulation for h.v. apparatus, **1976**
Camp, L., R. Vincent and F. du Breuil, 100-kc/s magnetostrictive transducer, **(A) 3329**
Camp, L. W., magnetostrictive radial vibrator, **(A) 2151, 2698**
Campbell, N. R., and V. J. Francis, random fluctuations in c.r.o. with high gain amplifier, **252**
—— and L. Hartshorn, experimental basis of electrostatics, **1909**
—— V. J. Francis and E. G. James, common-cathode amplifiers, **2490 ;** valve noise and Poisson's law, **2420**
Canavan, J. J., merchant marine radio, **2926**
Cannon, W. F., with L. A. Lord, microwave spectrum of NH_3, **1018**
Caporale, P., v.h.f. short range navigation and landing aids, **427**
Capps, I. L., recording stylus with multiple burnishing facets, **1234**
Carbenay, F., operation threshold of atmospherics recorder, **2903,** corresponding range of atmospherics, **3504**
Carlin, H. J., dissipative microwave networks for broad-band matching, **(A) 2475**
Carlson, F. D., with others, voice measurements with audio spectrometer, **3316**
Carlson, W. L., field strength recording on 47.1, 106.5 and 700 Mc/s, **2892**
Carman, R. D., f.m. pulses, **2204**
Carnahan, C. W., squelch circuits for f.m. receivers, **2601**
Carpentier, E. E., c.r.o. with push-pull amplifiers, **2014**
Carr, W. J., Jr, magnetic measurements on high-μ material, **176**
Carter, G. S., and R. Koontz, test characteristics of recording wire, **3149**
Carter, R. L., and W. V. Smith, microwave spectrum frequency markers, **1353**
—— with W. V. Smith, microwave absorption of NH_3, **(D) 406**
—— with others, frequency stabilization of microwave oscillators by spectrum lines, **2180**
Carter, T., Ohm's law, **83**
Cartwright, M. L., forced oscillations in nearly sinusoidal systems, **2740**
Cashman, R. J., PbS photoconductive cells for sound reproduction, **1200**
Casimir, H. B. G., eddy currents in ferromagnetic materials, **401**
Cavanaugh, R. T., spurious oscillations in television receivers, **3268**
Cawkell, A. E., loudspeaker damping, **(D) 938**
Cetrone, V. C., electronic engine analyser, **2310**
Chaffee, J. G., terminals for New York/Boston radio relay system, **2920**
Chai Yeh. See Yeh, Chai.
Chakrabarty, S. K., solar activity and magnetic storms, **1680**
Chalmers, R. G., with H. A. Thomas, ionospheric height recorder, **2240**
Chamagne, —, and — Guyot, 6-channel multiplex broadcasting equipment, **541**
—— and G. Guyot, measurement of valve background noise, **489;** synchronization of low-power transmitters, **3272**
Chamberlin, R. H., with others, KSBR 50-kW 100.5-Mc/s f.m. transmitter, **592**
Chambers, A. G., crystal-controlled reactance modulator, **2958**
Chambers, C. V., mobile transmitter for 144 Mc/s, **2400 ;** 120-W modulator and speech amplifier, **56**
Champeix, R., spectral emissive power of oxide cathodes, **1010, 2973**
—— with J. Debiesse, effect of light on emission from oxide cathodes, **607;** hot-cathode photocell, **1817**
Champion, F. A., protective films on Al and alloys, **3446**
Chance, B., time demodulation, **807;** time modulation, **862**
—— J. N. Thurston and P. L. Richman, packaged amplifiers, **2207**
Chandler, C. H., with others, stereoscopic viewing for c.r. tubes, **2984**
Chang, Sze-Hou, characteristics of separately quenched superregenerative circuit, **(A) 2596**
Chapel, C. E., guided missiles, **2824**
Chapman, J. J., with G. Camilli, gaseous insulation for h.v. apparatus, **1976**
Chapman, Seville, d.c. amplifier, **(A)894**
Chapman, Sydney, currents causing solar and lunar geomagnetic variations, **1024 ;** magnetic field of moon, **710;** magnetic storms ; **1636;** main geomagnetic field and secular variation, **(AD)3409;** stratosphere, **1357;** variation of geomagnetism with depth, **2516**
—— and D. R. Bates, aurorae and night-sky light, **730**
Charanjit, —, with others, He-filled G-M counters, **3474**
Charbonnier, R., and J. Royer, circuits and valves in electronics, **359;** video amplifiers, h.f. correction of, **1799,** l.f. correction of, **1194**
Chasmar, R. P., h.f. characteristics of PbS and PbSe photocells, **2661**
—— with T. S. Moss, spectral response of PbSe, **2662**
Chatt, E. S., with others, magnetic properties of fine wire, **1083**
Chatterjea, P. K., synchrodyne receiver, **(D)1139**
Chatterjee, S. K., and B. V. Sreekantan, u.h.f. absorption by salt solution, **3099**
Chaudhri, M., and A. G. Fenton, adjustable G-M counters, **2578**
Chaudron, G., with R. Faivre, properties of $SrCO_3/BaCO_3$ mixtures, **1654**
Chauvierre, M., secondary emission amplifier valve, **318;** television projection, **1786;** television receivers, proposed standards for, **1191,** R.C.A. Type 630, **300;** television timebase, **1791;** trends in mass production of radio receivers, **2066**
Cheatham, T. P., Jr, with W. G. Tuller, adjustable bandwidth f.m. discriminator, **239**
Cheek, R. C., power line carrier communications, **819**
Cherrick, I. L., rugged valves, **2966**
Cherry, E. C., with others, electrolyte tank for a.c. field distributions, **3459;** pulse-testing of wide-band networks, **1101**
Cherry, R., with others, variable capacitor for pressure and displacement measurement, **200**
Cherry, W. H., colorimetry in television, **568**
Cherry, W. L., Jr, and R. Adler, piezoelectric effect in $BaTiO_3$ ceramics, **741**
Chervet, D., and J. Henry, correction formula for frequency of Helmholtz resonators, **2998**
Chilton, C., with others, 3-cm spectrometer and mismatching impedance unit, **2017**
Chin, P. H., with C. S. Roys, constant-current networks, **(A)2475**
Chinn, H. A., tape recorders, **945**
—— and P. Eisenberg, sound reproduction, listeners' preferences, **1237, 2695**
—— and R. B. Monroe, broadcasting studio sound reinforcement, **1540**
Chipp, R. D., video switching and distribution system, **116**
Chodorow, M., E. L. Ginzton and J. F. Kane, microwave impedance bridge, **(A) 2552**
Chow Quantie, with others, efficiency of ZnS phosphors, **3422**
Chrétien, L., a.f. output transformer, **3034;** e.s. *vs* e.m. deflection for television receivers, **1192;** feeding loudspeakers in parallel, **14;** high-fidelity receiver, **2336, 3229;** optimum load impedance in power stages, **906;** virtual triode, **1607**
Christensen, J. W., with others, instantaneous radio audience-measurement system, **(A) 2430**
Christensen, R. J., with others, reverberation in the sea, **3290**
Christian, D. R., direct-coupled oscillograph amplifier, **(A)65**
Christiansen, W. N., rhombic aerial arrays, **2464**
Chrzanowski, P., short-tube method of acoustic impedance measurement, **(A) 3308**
Chu, E. L., and W. W. Hansen, theory of disk-loaded waveguides, **1253**
Chu, L. J., physical limitations of directive radiating systems, **(A)2443**
—— and J. D. Jackson, field theory of travelling-wave valves, **3549**
Cioni, G., transmission-line calculations, **(D)1256**
Clack, G. T., simplified signal and test-pattern generators, **2388**
Clapp, J. K., equivalent circuit of quartz bar, **3049 ;** frequency measurement by sliding harmonics, **(A) 2552;** high-stability LC oscillator **2193**
Clare, J. D., stable voltmeter amplifier, **2847**
Clark, D. L., flexible decade a.f. amplifier, **1317**
—— and L. L. Merrill, field measurements on magnetic recording heads, **1244**
Clark, K. C., with others, voice measurements with audio spectrometer, **3316**
Clark, M. E., with J. P. Van Duyne, a.f. square-wave analysis, **1081**
Clark, R. W., and H. C. Gronberg, television studio technique, **1783**
Clark, T. H., errors in spaced-collector d.f. systems, **494;** multiplex microwave R/T, **(A) 542**
—— and V. F. Clifford, variable-frequency 2-phase sine-wave generator, **2486**
Clauser, H. R., metal-coated plastics, **3155**
Clavier, A., and L. Rhetzon, Paris-Montmorency f.m. radio link, **651**
Clavier, A. G., P. F. Panter and W. Dite, signal/noise ratio in pulse-count modulation system, **(A) 2614**
—— P. F. Panter and D. D. Grieg, distortion in pulse-code modulation, **(A) 2281**
Clayton, R. B., with C. J. Milner, resistance comparison at 3300 Mc/s, **1899**
Cleckner, D. C., parasitic beam patterns, **3363;** polar diagrams of straight wire aerials, **25**
Clegg, J. A., with A. C. B. Lovell, radio echoes from meteor trials, **2782**
—— with others, radio echoes, from aurora, **482,** from Giacobinid meteors, 1946, **2780**
de Clejoulx, B., radio communications conference at Atlantic City, **1748**
Clevenger, G. W., with others, tuner-amplifier for television receivers, **(A) 2647**
Clifford, V. F., with T. H. Clark, variable-frequency 2-phase sine-wave generator, **2486**
Close, R. N., and M. T. Lebenbaum, phantastron delay circuits, **2478**
Coales, J. F., H. C. Calpine and F. S. Watson, naval fire-control radar, **(D) 732**
Cobb, D. A., with others, v.h.f. cross-channel communication, **1497**
Cobine, J. D., and J. R. Curry, electrical-noise generators, **875**
—— and others, h.f. properties of iron alloy cores, **754**
Cocking, W. T., deflector-coil efficiency, **1181, 3535;** push-pull balance, **997;** push-pull input circuits, **1325, 2211, 2212;** selectivity and sound-channel rejection in television amplifiers, **2961**
Coe, J. C., variable reluctance tachometer calibrated against WWV, **195**
Coggeshall, E. J., E. W. Felegy and L. H. Harrison, emergency communications in mines, **2367**
—— with E. W. Felegy, emergency communications in mines, **3517**
Coggeshall, N. D., magnetic focusing, **1124**
Cohen, A. A., and W. R. Keye, alteration of digital data in magnetic-drum

computer memory, (A) 2548
Cohen, R. M., performance of television receiving valves, 2971
Cohen, V. W., and A. Bloom, microphony in subminiature triode, 3556
Cohn, S. B., broad-band waveguide/coaxial-line junctions, 335; properties of ridge waveguide, 23; wide-band waveguide filter, (A) 2443
Coile, R. C., magnetostriction resonant frequencies abac, 1
de Cola, R., monitoring c.r.o., 2567
Cole, C. D., experimental needle-scratch suppressor, 1235
Colebrook, W. A., with J. E. Benson, telecontrol of receivers for aircraft communication, 275, 2636
Colin, R. I., survey of radio navigation aids, 429
Collard, J., cm-λ voltage measurement, 2007; enthrakometer, 2020
Collie, C. H., J. B. Hasted and D. M. Ritson, dielectric properties, of polar liquid at cm λ, 1991, of water and heavy water, 2508
—— with others, dielectric properties of water, heavy water and solutions at h.f., 79
Collins, S. C., low-temperature phenomena, 3385
Collins, W. H., Collins f.m./a.m. tuner, 2347
Colombo, S., with T. Kahan, transient state in waveguides and cavity resonators, 3019
Colvin, J. D., audio systems for f.m. studios, 936; planning a broadcasting studio installation, 825
Cook, A., with others, radio transmitting station at Criggion, 2371
Cook, E. G., disk recording, increasing volume level in, 2707, noise modulation in, 1538; feedback recording head, 1242
Cook, G. S., with E. L. R. Corliss, hearing-aid gain measurement, 2157, 2442
Cook, R. K., equations of piezoelectricity, 3082; short-tube method of acoustic impedance measurement, 921, (A) 3309; theory of Wagner earth for a.c. bridges, 2853
Cooke, A. H., G. Fertel and N. L. Harris, electronic switches for single-aerial working, 2643
Cooke, D., pulse communication, 2079, (D) 2618
Coombs, S. H., use of c.r.o. in transmitter adjustment, 2290
Cooper, C., with others, Description of the Earth's Main Magnetic Field and Its Secular Change, 1905–1945, (B) 1645
Cooper, G. R., dielectric heating, applications to woodwork, 505
Cooper, M., film and television, 843
Cooper, R., breakdown strength of air at cm λ, 750, (D) 3436
Cooper, R. I. B., attenuation of 200-Mc/s signals by rocks, 3476; portable crystal-controlled frequency standard, 3167
Cooper, W. H. B., and R. A. Seymour, temperature-dependent resistors, 666
Cooter, I. L., with others, visual observation of patterns recorded on magnetic media, (A) 2430
Cope, J. E., with others, Army wireless set No. 10, 2624
Copeland, W. C., N.P.L. mobile acoustics laboratory, 1534
Corbell, P. I., Jr, and H. R. Jacobus, triodes for 3-kW and 10-kW f.m. transmitters, 876
Corbett, C. W., high-power linear r.f. amplifiers, 989
Corcoran, N., and J. M. Hough, combined polar diagram of aerial, flat earth and screen, 2462
Cordovés, J. S., f.m. television link, 1794
Corey, V. B., sonic air-speed indicator, (A) 3486
Corfield, D. N., and C. W. Cragg, modified micromatch, 3176
Cork, B., with others, Berkeley 4-MeV e s. generator, (A) 2311
Corliss, E. L. R., and G. S. Cook, hearing-aid gain measurement, 2157, 2442
Cormack, W., losses in iron at high flux densities, 3455
Cornelius, E. E., d.c. mains-operated vibratory inverter, 277
Cornelius, P., and J. van Slooten, improved diversity and directive broadcast reception, 255
Corrington, M. S., bandwidth and modulation index in f.m., 859
Cosman, B. J., 152–162-Mc/s mobile equipment, 2361
—— and A. W. Richardson, Harvey double superheterodyne f.m. receiver, 246
Cosslett, V. E., electron microscopy conference, Leeds, 1947, 3208
Costrell, L., determination of dead- and recovery-time for G-M counters, (A) 2574
Cotte, M., propagation of perturbation in waveguide, 2447
Coudrier, S., low-pass filters, 1001
Coulomb, J., forecasting diurnal variation of declination, 108
Coulson, C. A., random walk problem, 701
Cousins, E. W., with N. J. Thompson, measuring pressures of explosions, 787
Covington, A. E., microwave sky noise, 721; solar noise at λ 10.7 cm, 2518
Cowan, F. A., coaxial-cable networks, 645
Cowling, T. G., Alfvén's theory of sunspots, 2231; elementary particles and the geomagnetic field, 3407; solar magnetic field, 3404
—— and R. Borger, conductivity of D layer, 3116
Cox, C. R., mutual impedance of vertical aerials, 658
Cox, J. W., with K. W. Tremellen, wave propagation and s.w. communication, 2050
Crabtree, J., rubber and weather, 2831
Cragg, C. W., with D.N. Corfield, modified micromatch, 3176
Craggs, J. D., and A. A. Jaffe, discharge spread in G-M counters, 1103
—— W. Bosley and A. A. Jaffe, G-M counters, 2032
—— M. E. Haine and J. M. Meek, triggered spark gaps for high-power modulators, 833
Craig, H., uniform magnetic field between coils, 400
Craig, R. H., c.r. tube design, 2416
Cramer, C. H., sunspots and telegraphy, 712
Cramer, H. S., printing conductors on glass, (A) 1614
Crampton, C., naval radio, 1956
Crandell, C. F., with A. L. Samuel, waveguide bridge to measure gain at 4000 Mc/s, (A) 2552
Crane, H. R., with others, design of synchrotron magnets, 1121
Cranston, E. F., with D.F. Bowers, Trader and Oceanspan marine transmitters, 2397
Crapuchettes, P. W., wide-tuning-range c.w. magnetrons, (A) 2663
Crawford, K. D. E., h.f. pentodes in electrometer circuits, 3557
Crawford, R., with others, design of Berkeley linear accelerator, (A) 2316
Creamer, A. S., with others, Ba-Mg titanate dielectrics, 3441
Creighton, J. L., H. B. Law and R. J. Turner, crystal oscillators, 2195
Criss, G. B., servomechanism theory, 1762
Croney, J., with others, automatic control in radar receivers, 808
Crosby, E. L, Jr, G. W. Clevenger and H. Goldberg, tuner-amplifier for television receivers, (A) 2647
—— with H. Goldberg, series-mode crystal-oscillator circuits, 3046
Crout, P. D., transient behaviour of electrical systems, 661
Crowley-Milling, M. C., absorption wavemeter for 120–500 Mc/s, 1692
—— and others, cm-λ and dm-λ power measurement, 2022
—— with others, waveguide attenuators, 1892
Crowther, J. A., history of electron discovery, (A) 1011
Croxson, C., crack detection by X rays and γ rays, 2305
Coccia, C. L., and H. R. Hegbar, u.h.f. low-pass coaxial filter, 1613
Cuffe, R. C., lightning-arrester discharge currents, 3389
Cullen, A. L., measurement of 10-kV pulse voltages at 200 Mc/s, 1688
Cundy, P.F., 35-Mc/s high-pass filter, 1893
Cunningham, W. J., graphical methods for evaluating Fourier integrals, 154
—— S. J. Goffard and J. C. R. Licklider, effect of limiters and selectivity on receiver performance, 814
Curie, M., Fluorescence et Phosphorescence, (B) 453
Curran, G. W., artificial-reverberation system, 3320
Curran, L. K., double-diversity 2-channel single-sideband receiver, 2598
Curran, S. C., and E. R. Rae, G-M counters, analysis of impulses from, 1708, with beaded wires, 494
—— and J. M. Reid, nonsymmetrical counters, 2577
Curry, C., with J. Ewles, c.r.o. recording micrometer, 786
Curry, J. R., with J. D. Cobine, electrical-noise generators, 875
—— with others, h.f. properties of iron-alloy cores, 754
Curtis, J. A., broadcasting systems for trains, 270
Curtis, R. W., with C. Brunetti, printed-circuit techniques, 1894
Curtiss, L. F., diamonds as radiation detectors, (A) 2575
Cutler, C. C., experimental determination of helical-wave properties, 2409; parabolic-aerial design for microwaves, 657
—— A. P. King and W. E. Kock, microwave aerial measurements, 1281
Cutolo, M., gyro-interaction of radio waves, 2055

D

Dahl, H. M., RC circuits as equalizers, 2742
Dailey, H. J., thoriated tungsten filament design, 1655
Dalby, L. J., war-surplus television receiver, 3267
Dale, A. E., and J. E. Stanworth, solder glasses, 3445
Dällenbach, W., spiral accelerator for heavy particles, 2585
Dalman, G. C., miniature double triode, 873
Daly, E. F., and G. B. B. M. Sutherland, infra-red spectroscope with c.r. presentation, (D) 493
Daniel, G., intermodulation meter, 2296
Darmois, E., frictional electricity, 1620
Das Gupta, M. K., J. Ray and S. R. Khastgir, inherent noise in receivers, 2349
—— with others, directional observations of atmospherics at sunset, 1363
Daskam, E., with E. H. B. Bartelink, f.m. short-range carrier system, 1152
Daudt, W., measurement of noise factor, 1482
Dauvillier, A., magnetism of celestial bodies, 1022
Davey, J. R., and A. L. Matte, frequency-shift telegraphy, 2362, 2913
Davidson, P. M., interaction of radiation and matter, 1341
Davies, G. T., with J. G. Bartlett, high-speed oscillographs, 1690
Davies, H., high-fidelity disk recording equipment, 17
Davies, J. G., with C. D. Ellyett, velocity of meteors, 3101
Davis, F. F., vacuum furnace control, 2581
Davis, H., physiological effects of ultrasonics, (A) 3299
—— and others, Hearing Aids, (B) 2714
Davis, K. H., multivibrator step-down by rational ratios, 2747
Davis, L., Jr, stellar e.m. fields, 415
Davis, R., and W. G. Standring, discharge currents in kite-balloon cables, 1634
—— A. E. W. Austen and W. Jackson, voltage characteristics of polythene cables, (D) 2841
Davis, W., auxiliary publication of scientific papers, 2423
Davy, N., polepiece shape for synchrotron magnet, 3481
Dawe, F. W., wide-range a.f. oscillator, 50
Dawe, P. G. M., RC oscillator, (A) 1298
Dawley, R. L., (Ed.), Radio Handbook, (B) 2680
Day, J. R., and M. H. Jennings, quadriline power amplifier, 593
De Baun, J. R., interlocked scanning for network television, 1773
Debiesse, J., and R. Champeix, effect of light on emission from oxide cathodes, 607; hot-cathode photocell, 1817
DeBolt, H. E., with E. M. Williams, oscillator design for 130-inch f.m. cyclotron, (A) 2574
Debraine, P., and C. Simané, automatic synchronization of cyclotron, 2038
Debray, M., with others, abnormalities in F region at Calcutta, 2522
Decaux, B., frequency change during propagation, 1725
Deerhake, F. M., New York/Schenectady television relay system, 1792
Degelman, J., photocell-operated trigger circuits, 1572
Deibert, C. R., with others, concentrated-arc lamp for light-beam communication, 585
Delaby, H., synchronization in television, 2089
Deláygue, A., theory of origin of earth's magnetic field, 2517
Dellinger, J. H., ionosphere, 107
—— and Newbern Smith, war-time work of I.R.P.L., 2049
Delvaux, J. L., selection of television standards, 2650
Demanche, —, radar technique and development, 431, 1366, 3125
Denis, M., and R. Liot, measurements at cm λ, 1076, 3454
Denisse, J. F., solar and galactic m-λ radiation, 1626; solar radiation, r.f., 1026
—— P. Seligmann and R. Gallet, ionosphere and solar eclipse, 20th May 1947, 1640
Denly, J. D., with others, u.h.f. mobile and fixed communication, 2081, (D) 3514
Denney, B. H., c.r.o. images of noise-reduction envelopes, 2150
Dennison, D. M., with H.H. Nielsen, microwave spectrum of NH$_3$, 1019
Denny, C. R., Jr, F.C.C. review of radio progress, 905
DePackh, D. C., resistor network for solving Laplace's equation, 1071
Department of Scientific and Industrial Research, The Fundamental Research Problems of Telecommunications, (B) 2995
DeSantis, V. J., with M. Arditi, thermionic emission from grids, (A) 2663
Descarsin, M., valve developments in France, 1822
DeTurk, J. E., with others, design of large-scale digital computer, (A) 2548
DeVore, H. B., limiting resolution in image-orthicon, 2385
Devoy, J. R., thyratron circuit for motor control, 2580
DeWitt, R. H., studio/transmitter link on 920–980 Mc/s, 3250
Dexter, G., signal generator for 90 kc/s to 210 Mc/s, 1416
Diamond, J. M., circle diagrams for cathode followers, 2210
Diaz, J. B., and A. Weinstein, Schwarz' inequality, 1069
Dicke, R. H., high speed coincidence circuit, 1571; matrix computation for microwave networks, 1073
Dickinson, H. C., functional analysis of measurements, 466
Diemer, F., Über Synchronisierung von Röhrengeneratoren durch Modulierte Signale, (B) 2503
Dieutegard, J., autostabilized oscillator, 1306; transmitter-receiver, 280–330 Mc/s, 308
Dighton, D. T. R., H. M. Ross and A. L. Shuffrey, modulation and waveform of light beam, 1087
van Dijl, B., frequency standards and electronic counters, 482; rhombic aerial design, 1863
Dilworth, C. C., effect of surface films on contacts, 2769
Dimmick, G. L., light modulator for sound recording, 1853
Dinger, H. E., and H. G. Paine, accuracy of radio-noise meters, (D) 1484; impedance-matching λ/2 transformer, 3042
Dirac, P. A. M., Principles of Quantum Mechanics, (B) 1917
Dishal, M., band-pass amplifier design, (CD) 1315, 2493, (D) 3064; Tchebyscheff polynomials and band-pass filters, (A) 2475
—— with H. Busignies, characteristics of navigational and d.f. systems, (A) 430
Dite, W., with others, signal/noise ratio in pulse-count modulation system, (A) 2614
DiToro, M. J., phase and amplitude distortion in linear networks, 1901, (C) 2764; phase-corrected delay lines, (A) 2475
—— and R. C. Wittenberg, parameter-adjustment method for network transients, (A) 2475
Dix, J. C., cm-wave communication systems, 266
—— and E. C. S. Megaw, low-power cm-λ magnetrons, 2987
—— with others, Army wireless set No. 10, 2624
Dlugach, G. V., and I. M. Sorkin, measurement of deviation ratio in f.m., 1404
Dodds, J. M., and J. H. Ludlow, C. H. radiolocation transmitters, 853
Dodington, S. H. M., with others, tests on navar system, (A) 428
Doehler, O., and W. Kleen, travelling-wave valves, energy exchange in, 602
Doetsch, G., Tabellen zur Laplace-Transformation und Anleitung zum Gebrauch, (B) 3450
Doll, E. B., with H. G. Boyle, compact projection television system, 2651
Domb, C., random walk problem and application, 700; theory of oscillator coupled to long feeder, 2200
—— and M. H. L. Pryce, field strength over spherical earth, 800
Donal, J. S., Jr, and R. R. Bush, a.m. of magnetrons, (A) 2663
Donley, H. L., (Ba/Sr)TiO$_3$ resonators, 3138; dielectric properties of BaTiO$_3$/SrTiO$_3$ mixtures, 446
Doolittle, H. D., and E. B. Steinberg, industrial heating, valve operating conditions, 3275
Dorr, C. J., and H. M. West, relay control circuits for stepping switches, 1573
van Dorsten, A. C., W. J. Oosterkamp and J. B. le Poole, electron microscope for 400 kV, 2039
Douglas, C. A., objective visibility measurement, 205
Douglas, G. A., triple loudspeaker system, 2705
Douma, T., voltage impulses in rectifiers, 1286
Downie, J. W., and others, television transmitter design, 1810
Downing, A. C., micro-galvanometer coils, 3174
Draper, J. H. P., and D. G. Tucker, square-law circuit, 670
Drenner, D. V. R., B.B.C. remote amplifier and programme meter, 992; magnetophon, 641
Dresel, L. A. G., with others, transmission line diode as cm λ noise source, 2073
Dreyfus-Graf, J., Doppler effect formulae in ellipsoidal theory of special relativity, 2591
Driatski, V. M., magneto-ionic splitting of e.m. waves in sporadic-E layer, 2051
Drobov, S. A., rheostat trigger circuits, 1870
Drozhzhina, V. I., M. G. Luzhinskaya and Ya. S. Shur, effect of rust and recrystallization on soft magnetic materials, 1983
Duckworth, H. E., with B. G. Hogg, vacuum properties of synthetic dielectrics, 3144
Dufay, J., with J. Cabannes, spectrum of night sky in blue and violet, 2523
Duffield, S. H., and I. R. Lankes, electronic testing of camera shutters, 3479
Duffieux, P. M., diffraction phenomena, 1342
Dufour, J., with W. Klein, f.m. u.s.w. broadcasting, 2893
Du Hart, B., narrow-band f.m. adapter, 1734
Duke, C., with F. Schumann, r.f. bridge for broadcast stations, 2563
Dumousseau, —, with others, wide-band amplifier valves for cm λ, 1834
Dunaev, Yu. A., low-temperature resistance of PbS, 85
—— and Yu. P. Maslakovets, physical properties of PbS, 1656
Dunbar, J. Y., sound studio acoustics, 935
Dungey, J. W., and C. R. Hull, coaxial electron lenses, 510
Dunham, J. M., power-line connections for carrier telephony, 2355
Dunn, B. C., Jr, and R. King, currents excited on conducting plane by parallel dipole, 1910
Dunn, R. W., with S. P. Osborne, ploughing by radio, 1131
Dunsheath, P., (Ed.), Industrial Research, 1947, (B) 1527
Dunsmuir, R., and J. G. Powles, dielectric properties of liquids at λ 9.4–50 cm, 1992
—— C. J. Milner and A. J. Spayne, pinhole radiography of magnetrons, 2670
Dunstan, L. A., machine computing of networks, 160
Dupouy, G., galvanometer with adjustable sensitivity, 1085
Durand, É., classical e.m. equations, 1009; e.m. theory of diffraction by black screens, 3096; new diffraction formula, 3095
Durand, E., with R. V. Pound, Microwave Mixers, (B) 2609
Durand, J., with others, solar effect on ionosphere, 3110
Durkee, A. L., microwave propagation tests overland, 2063; New York/Boston microwave relay system, 1755
Dürrwang, J., Radio-Technik, Theorie und Praxis, (B) 1530
Durst, C. S., radio climatology, 1943
Dyatlovitskaya, B. I., with others, Sb–Cs cathodes, 3550
Dyett, E. C., Jr, with H. H. Scott, audio amplifier and noise suppressor, 2759
Dymond, E. G., Kew radiosonde, Mark 1A, 197
Dyson, J., r.f. power measurement by differential thermometer, 1093
—— and B. A. C. Tucker, contour plotter for directive aerials, 1864
Dzung, L. S., and A. Meldahl, units, dimensions and similitude, 2504

E

Easton, A., picture-modulated television signal generator, (A) 2552, 3469; pulse rise and decay time measurement, 189
—— and P. H. Odessey, counter circuits for television synchronization, 2472
Easton, I. G., with R. F. Field, wide-frequency-range capacitance bridge, 180
Eaton, J. C., with others, impedance-matching transformer, 1296
Eckersley, P. P., broadcasting jubilee, 1525
Eckersley, T. L., differential penetration, and magnetic storms, 1945, theory, 726; evaporation of meteors, and scatter clouds, 91; triple splitting of ionospheric rays, 3222
Eckert, J. P., Jr, with others, Hg delay-line memory, (A) 2475
Eddy, W. C., television studio lighting, 1184
Eder, F. X., dielectric aerial losses, 1274; dielectric properties of ice, 1077
Edmondson, A. S., matching of h.f. transmission lines, 2167
Edson, J. O., with H. S. Black, pulse-code modulation, (A) 2363
Edson, R. C., carrier-system common-terminal equipment, 2611
Edwards, A., standard terms and abbreviations, (D) 2676
Edwards, C. F., microwave converters, 663
Edwards, G. W., with others, television receiver design, 1187
Efrussi, Ya. I., amplitude filters, 1460
Egan, J. P., effect of noise on hearing, 1536
—— with others, measuring speech spectra, 924
Egedal, J., diurnal variation of H near magnetic equator, 1936, 2790
Egidi, C., direct-reading frequency meters, 2016
Ehrenhaft, F., particle motion in magnetic field, 1020
Ehrke, L. F., with C. M. Slack, high-speed radiography, 1715
Eichholz, G., and G. F. Hodsman, h.f. permeability of ferromagnetic materials, 136
van den Eijk, J., and C. Zwikker, sound absorption by porous materials, 3322
—— C. W. Kosten and W. Kok, sound absorption by porous materials, 2144
—— with others, sound absorption by porous materials, 3322
Eisenberg, P., with H. A. Chinn, sound reproduction, listeners' preferences, 1237, 2695
Eisenstein, A., electrical properties of oxide-cathode interface, (A) 315
Eisenstein, J. C., with others, voice measurements with audio spectrometer, 3316
Electronics, acoustic materials, 3004; ceramics and glass, 3142; crystals and rectifiers, 3133; electronic micrometer, 788; fluorescent compounds, 3131; image-intensification tube for X rays, 3568; image-storage tube, (A) 2983; magnetic amplifiers, 1567, material for, (A) 3431; magnetic materials, 3146; metals and alloys, 3150; narrow-band f.m. frequency allocations, 536; plastics and rubbers, 3152; production of EDT crystals, 739; selective sequence digital computer, 2569; subminiature valves, 866; technical bibliographies, 3280; telecontrol for water works, 1761; television resolution chart, 1179; valve characteristics with 28-V supply, (A) 1207; v.h.f. mobile facsimile equipment, 290; X-ray thickness gauge, 2302; 4-tetrode f.m. power amplifier, 70
Elenbaas, W., cooling-conditions and high pressure discharges, 2226; Hg high-pressure discharge, 399
Elger, H., fault location on h.v. lines by radio methods, 2539
Eliezer, C. J., interaction of electrons and e.m. field, 698
Elinson, M. I., with others, auto-electron emission from thin dielectric films, 88
Elliott, A., and G. G. MacNeice, atmospheric transmission at 1–5μ, 3098
Elliott, G., 5–10-m converter for the R 1155, 1143
Ellis, B. T., multichannel communication transmitters, 2955
Ellis, C. F., with others, Army wireless set No. 10, 2624
Ellis, J., bass compensation in disk reproduction, 18
Ellis, S. G., diaphragms in electron microscope, 1435; optics of 3-electrode electron guns, 1126
Ellis, W., with others, reflectors for wide-angle scanning at cm λ, (A) 2443
Ellison, M. A., solar flare, July 1946, 1631
Ellwood, W. B., glass-enclosed reed relay, (A) 2375
Ellyett, C. D., and J. G. Davies, velocity of meteors, 3101
—— with others, radio echoes from aurora, 422
El-Mawardi, O. K., measurement of acoustic impedance, (A) 3305
Elsasser, W. M., induction effects in geomagnetism, 1028
Elson, N., with A. B. Pippard, computation of standing waves in paraboloid waveguide-fed aerials, 2469
El'tsin, I. A., dielectric-constant and loss-angle measurement by plate method, 3169
E. M. I. Laboratories, electronic switching, 357
Emslie, A. G., and others, ultrasonic delay lines, 2479
—— with others, ultrasonic delay lines, 2479
von Engel, A., with E. W. B. Gill, starting potentials of h.f. gas discharges, 1906
Engelberger, J. F., with C. G. Roper, electromechanical d.c. amplifier, 693
England, T. S., development of dm-λ transmitters for the R.A.F., 856
Engleman, C. L., underwater television, 1779
English, W. N., with L. B. Loeb, point-to-plane corona, (A) 2225
Ennis, N. F., broad-band crystal-controlled 10-m converter, 1471
Épelboim, I., magnetic permeability in weak fields, 175
Eppen, F., broadcasting service, 2637
Epstein, J., with others, v.h.f. television propagation measurements, 3224
Ergen, W. K., bridge-type electrical computers, 1072
Erhorn, P. C., tuning of parasitic arrays, 852
Erwin, W. S., and G. M. Rassweiler, ultrasonic resonance and non-destructive testing, 1112
Esafov, N. I., synchronization of loosely-coupled Thompson oscillators, 1582
Espley, D. C., telecommunication system in transient state, 1746
—— E. C. Cherry and M. M. Levy, pulse-testing of wide band networks, 1101
Espy, D., parallel-T network design curves, 3038
Essen, L., propagation constants of screened twin cables, 1889; resonance wavemeters for 1000–25000 Mc/s, 2019
—— and A. C. Gordon-Smith, velocity of e.m. waves, 3488
—— with G. H. Aston, frequency measurement at 10000–50000 Mc/s, 2015

Estermann, I., A. Foner and J. A. Randall, resistivity and Hall effect of Ge at low temperatures, (A) **139**
Estrabaud, S., ionospheric refraction, **2884**
Etzold, H., d.c. amplifiers with a.c. feed, **1324**
Etzold, —, 2-channel system with f.m. and a.m., **1494**
Evans, B. B., rubber dielectrics, **3145**
Evans, D. S., e.m. forces in solar prominences, **414**; solar flares, **1356**
Evans, P. B. F., with others, alignment signal generator with display, **1695**
Evans, U. R., atmospheric corrosion of contacts, **3435**
Everitt, W. L., (Ed.), Fundamentals of Radio, (B) **1222**
Ewing, D. H., H. J. Schrader and R. W. K. Smith, teleran, **1647**
Ewing, L. M., with others, television transmitter design, **1810**
Eyres, J., and C. Curry, c.r.o. recording micrometer, **786**
Eyring, C. F., R. J. Christensen and R. W. Raitt, reverberation in the sea, [illegible]

F

Fagot, J., radio aids to aerial navigation, **2249**
Fails, W. A., [illegible] Mason and K. S. Packard, v.h.f. s.w.r. plotting device, (A) **2552**
Fair, I. E., crystal control unit for 200–1040 kc/s, **143**
Faivre, R., and G. Chaudron, properties of $SrCO_3/BaCO_3$ mixtures, **1654**
Fajon, P., coupled circuits and filters, theory, **365**
Falkus, A. E., output transformer efficiency measurement, **1407**
Familier, V., transmitter matching ranges, **2401**
Fancher, H. B., with others, television transmitter design, **1810**
Fano, R. M., and A. W. Lawson, Jr, microwave filters with λ/4-line couplings, **695**
Faragó, P. S., electron-multiplier tube, **2975**
Farnsworth, R. L., pocket signal tracer, **1700**
Farr, K. E., i.f. design for f.m. receivers, (A) **2596**
Fast, J. F., with J. L. Snoek, metastable states of Ni, **3429**
Fatehchand, R. T., with A. B. Shone, measurement of telegraph distortion, **2857**
Fauve, C., with others, effects of space charge in two-cavity klystron, **612**
Fawcett, C. H., with A. J. Baggott, magnetic and acoustic mine development, **790**
Fay, C. E., high-vacuum oxide-cathode p.m. valves, **1209**
—— and J. E. Wolfe, tunable pulsed triode oscillator, **1878**
Fay, R. D., and J. E. White, acoustic impedance from motional impedance diagrams, **2133**
—— R. L. Brown and O. V. Fortier, acoustic impodance of surfaces in water, **920**
Feiker, G. E., and H. R. Meahl, direct-reading wavemeter design for λ 2–75 cm, **2293**
Feinberg, E. L., wave propagation theory, **1721**
Feinstein, S. M., photoelectron multipliers with Sb–Cs cathode, **2100**
Felch, E. P., and others, airborne magnetometers, **220**
Fel'd, Ya. N., diffraction aerials, **1269**; excitation of waveguides and resonators, **3334**; radiating slit in waveguide, **2164**; slot aerials, **343, 3344**
Feldtkeller, R., charts for chokes, **1290**
—— and E. Stegmaier, complex permeability of coil cores, **3137**, with airgap, **2808**
Felegy, E. W., and E. J. Coggeshall, emergency communications in mines, **3517**
—— with others, emergency communications in mines, **2367**
Félici, N. J., and Y. Marchal, dielectric strength of compressed gases, **2824**
Felix, W., radio and the Swiss Post Office, **3575**
Fellers, R. G., and R. T. Weidner, admittance matching with irises, **649**
Felsenheld, R. A., with A. G. Kandoian, power loads at v.h.f. and u.h.f., (A) **559**
Felton, A., with R. S. J. Spilsbury, millisecond chronoscope, **465**
Fenton, A. G., with M. Chaudhri, adjustable G-M counters, **2578**
Ferguson, J. M., E. W. Webster and T. E. Calverley, Van de Graaff e.s. generator, **3258**
Ferrell, O. P., klystrons for amateur radio, **613**; motion of intense sporadic-E clouds, **3117**; propagation conditions for amateur bands, **1449**
Fertel, G., with others, electronic switches for single-aerial working, **2643**
Feshbach, H., with A. E. Heins, coupling of two acoustical ducts, **911**
—— with M. Lax, absorption and scattering by spheres and cylinders, **2120**
Fewings, D. J., Marconi h.f. direction finder Type DFG28, **2796**
Fiedler, G., ultrasonic therapy, **1709**
Field, R. E., losses in air-cored inductors, (A) **2475**
Field, R. F., connection errors in capacitance measurement, **169**
—— and I. G. Easton, wide-frequency-range capacitance bridge, **180**
Fielding, E. A., quartz crystals, (A) **2812**
Fiet, O. O., R.C.A. pylon omnidirectional aerial, **2454**
Filler, A. S., with others, body-baffle effects on hearing aids, **1248**
Fillmore, F., A. Hudgins and M. Jeppson, ion source for Berkeley e.s. generator, (A) **2312**
Fine, E. C., with others, reflectors for wide-angle scanning at cm λ, (A) **2443**
Fink, D. G., Radar Engineering, (B) **118**; r.f. remote control relay, **280**
Fisher, J., television signal generator, **775**
Fisher, J. F., with J. C. Tellier, testing long-persistence screens, **1652**
Fisk, D. B., and J. M. Whittenton, progress in instrument design, **474**
Fisk, E. T., development of sound recording and reproduction, **2153**
Fitch, E., spectrum of modulated pulses, **2619**
—— with Z. Jelonek, pulse communication, **2079**, (D) **2618**
Fitch, V. L., with E. W. Titterton, portable pulse generator, **2301**
Fitzgerald, A. S., magnetic amplifiers, design, **1285**, neutral type, **960, 2179**
Fitzpatrick, J. A., with others, distortion of ultrasonic waves, **2999**
Flach, W. I., home-built television receiver, **2391, 2392**; television interference suppression, **580**
—— and N. H. Bentley, high-quality home-made television receiver, **577**
Flamm, L., Faraday's theory and modern physics, **1343**
Flammersfeld, A., amplifier and h.v. supply for counters, **3066**
Flint, H. T., Max Planck, life and work, **2675**
Flohn, H., zonal atmospheric currents outside the tropics, **3120**
Flory, L. E., with others, barrier-grid storage c.r. tubes, **2986**
Fock, V., with M. Leontovich, e.m. propagation along earth's surface, theory, **1444**
Fock, V. A., diffraction of e.m. waves around the earth, **3489**; field of plane wave, **1351**
Foldy, L. L., with D. Bohm, synchro-cyclotron, **793**
Fonda-Bonardi, G., ordinary valves as microwave oscillators, **3052**
Foner, A., with others, resistivity and Hall effect of Ge at low temperatures, (A) **139**
Foot, J. B. L., 1-kW v.h.f. f.m. transmitter, **593**
Foote, N. M., vacuum drying of paper, **1383**
Forbush, S. E., solar effects in cosmic rays, (A) **102**
Ford, A. W., h.f. inductor alternators, **1172**
Ford, L. H., with G. H. Rayner, capacitance measurement at National Physical Laboratory, **2863**
Ford, W. B., adapting TBY-7 transceiver for amateur use, **1159**
Forgue, S. V., storage orthicon and teleran, **1780**
Forrest, J. S., semiconducting ceramic glazes, **1061**
Forrester, A. T., noise in electrometer valves, (A) **899**
Forró, M., magnetism of celestial bodies, **3406**
Forster, E., with others, carrier frequency-shift telegraphy, **2354**
Forster, W. H., 2-way television relay, **2921**
Fortet, R., with A. Blanc-Lapierre, stationary aleatory functions, **1866**
Fortier, O. V., with others, acoustic impedance of surfaces in water, **920**
Foschini, A., field equivalence of magnetic dipole and frame aerial, **1282**
Foster, A. G. L., valve voltmeter and d.c. volt-ammeter, **2572**
Foster, J., u.s.w. grounded-grid amplifier valves, **882**
Fouquet, L., with J. Benoit, capacitor for measurement of dielectric constant of liquid, **2554**
Fouty, R. A., with C. E. Smith, circular-polarization f.m. aerial, (A) **2443**
Fowler, C. J., with W. J. Bartik, extending frequency range of noise meters, (A) **2552**
Fox, A. G., adjustable waveguide phase-changer, **1255, 3338**
Fox, C., dynamic balancing of radar scanners, **2253**
Fox, F. E., and J. L. Hunter, simplified theory of supersonic interferometry, (A) **2439**
Fradkin, B., radio measurement apparatus, **2559**
Francini, G., RC oscillators, **1881**
Francis, A., television interference and frequency allocation, **538**; tricon navigational system, **1364**
Francis, V. J., with N. R. Campbell, random fluctuations in c.r.o. with high gain amplifier, **252**
—— with others, common-cathode amplifiers, **2490**; valve noise and transit time, **2420**
Franck, J. V., with others, linear accelerator oscillator and coupling system, (A) **2318**
Frank, J. M., W. S. Huxford and W. R. Wilson, modulation of resonance lines in Cs arc, **2353**
Frank, R., 10-m mobile f.m. transmitter, **1198**
Frankel, S., behaviour of multiconductor lossless transmission lines, (A) **2443**; field components in circular waveguides with coaxial dielectrics, **22**
—— J. J. Glauber and J. P. Wallenstein, triode for 600 Mc/s, **877**
Franklin, C. S., measurement of aircraft speed, **1703**
Franklin, E., with others, group velocity of radio waves in atmosphere, **1438**
Fränz, K., basic design principles for directive aerials, **2466**
Fraser, R. M., cinephotography of television images, **3263**
Frazer, R. A., escalator process for simultaneous equations, **3163**
Fredendall, G. L., with others, experimental simultaneous colour television system, **572**
Freeland, R. R., checking f.m. transmitter frequencies with WWV, **2856**
Freeman, J. J., theory and design of cavity attenuator, **2762**
Freeman, O., WABD apparatus for televising special events, **2949**
de Fremery, F., and J. W. G. Wenke, broadcasting programme monitoring equipment, **1500**
Fremlin, J. H., principles of v.m., **893**
French, H. A., with M. Silver, high-quality broadcasting radio links, (A) **2614**
French, N. R., spiral of human cochlea, (A) **3311**
Frenkel, Ya. I., relaxation theory of hearing, **1848**
Frerichs, R., photoconductivity of CdS, CdSe and CdTe, **450**
Friedman, H., with S. H. Liebson, self-quenching halogen-filled counters, **3197**
Friedman, H. S., correction plate for Schmidt projection system, **2652**
Friedman, T. B., circular polarization and f.m. coverage, **227**
Friend, A. W., continuous radar tropospheric soundings at 2.398 and 2800 Mc/s, (A) **2590, 2593**
Friis, H. T., and others, microwave repeater research, **2918**
Frings, H., with others, biological effects of intense sound, **1533**
Fritsch, V., h.f. testing of lightning conductor earths, **623**
Friza, R., test apparatus for enamelled wire, **1676**
Frobenius, W., with F. Ingerslev, open organ pipes, **2126**
Fröberg, C. E., interaction of two particles, (A) **223, 3213**
Fromy, E., voltage resonance of oscillatory circuit, **3045**
Frost, S., REAC analogue computer, **3161**
Frühauf, H., loss- and resonance-resistance of oscillatory circuit, **1998**; 2-element band-pass filters, **1337**
Fry, D. W., aerial systems for cm λ, **2459**
—— and others, travelling-wave linear accelerator for electrons, **506**
Fry, F. J., with W. J. Fry, coupling between infra-red radiation and supersonic field, (A) **2574**
Fry, W. J., and F. J. Fry, coupling between infra-red radiation and supersonic field, (A) **2574**
Fryer, P. W., with H. Stanesby, variable-frequency crystal oscillators, **2194**
Fubini, E. G., and P. J. Sutro, wide-band transformer from unbalanced to balanced line, **662**
Fuchs, J., magnetic field of rotating bodies, (D) **3108**
Fulbert, M., television receiver design and construction, **1190**
Fuller, H. W., numeroscope, **1574**
Furst, U. R., wow measurement, **3006**
Furth, R., theory of electrical fluctuations in valves, **2418, 2419**

G

Gabor, D., increasing electron microscope resolving power, **3210**; new methods of speech transmission, **1228**, (D) **2139**; space-charge lens for focusing ion beams, **215**
Gadsden, C. P., with others, cascode low-noise amplifier, (A) **2475, 3061**
Gaiani, G., class-C amplifier theory, **1313**
Gaines, W. L., h.f. oscilloscopes, **2566**
Gainsborough, G. F., sources of error in microwave milliwattmeters, **3466**; thermocouple milliammeters at v.h.f., (D) **1409**
Galin, J. L., audio filters for speech amplifiers, **1336**
Gallagher, C. J., with others, h.f. properties of iron-alloy cores, **754**
Gallagher, J., with others, Model-200 pulse counter, **1105**
Gallay, H., with D. D. Grieg, pulse-time-modulated multiplex radio relay system, **548**
Gallet, R., with others, ionosphere and solar eclipse, 20th May 1947, **1640**
Galletti, R., coupling between aerials and reflectors, **1273**
Galloway, W. C., with others, frequency stabilization of microwave oscillators, **3055**
Galvenius, I., and H. Wold, statistical tests of Alfvén's sunspot theory, **3105**
Gamara, N. J., with others, High-Frequency Measuring Techniques using Transmission Lines, (B) **2030**
Gane, P. G., and B. F. J. Schonland, ceraunometer, **2794**
—— with B. J. F. Schonland, lighting warning device, (D) **2793**
Ganguli, D. K., and S. R. Khastgir, interelectrode capacitances of triodes at u.h.f., **1830**
—— with others, directional observations of atmospherics at sunset, **1363**
Gannett, D. K., and W. R. Young, ratio of frequency swing to phase shift in ph.m. and f.m. systems, (A) **2430**
Gans, R., current distribution in aerials, **1558**
Gardner, G. F., with T. A. Rich, self-balancing potentiometer, **768**
Garlick, G. F. J., and A. F. Gibson, luminescence of phosphors, **2801, 3421**
—— S. T. Henderson and R. Puleston, c.r. tube screens for radar, **885**
—— with M. H. F. Wilkins, photoconduction and luminescence in ZnS, **3080**
Garlick, J., with D. G. Tucker, synchrodyne refinements and extensions, **1733**
Garlick, J. K., with D. G. Reid, absorption wavemeter for dm λ, **3464**; cm-λ beam telephone, **3506**
Garner, W. R., integration of energy in ear, **923**; loudness matching of short tones, (A) **3317**; loudness of repeated short tones, **3314**
—— and F. Hamburger, Jr, minimum signal and target separation on remote projection p.p.i., **731**
Garstang, W. W., with D. L. Hings, noise neutralization detector, **1487**
Garvin, S. J., permanent-magnet materials, **2826**
Gates, B. G., aeronautical communications, **2085**, (D) **2633**
Gatti, E., a.f. amplifier with variable selectivity, **1598**
Gauzit, J., with others, infra-red band in night-sky light, **1644**
Gavin, M. R., with others, u.s.w. triodes and oscillators, **683**
Gavreau, V., audibility of high-frequency sounds, **3002**
Gavrilov, F. F., with P. I. Vergunas, photoluminescence of ZnO, **1374**
Gassana-Priaroggia, P., input impedance of non-uniform transmission line, [illegible]
Gehlshøj, B., Electromechanical and Electroacoustical Analogies and Their Use in Computations and Diagrams of Oscillating Systems, (B) **2159**
Gejer, S., and P. Åkerlind, ionospheric investigations in Sweden, 9th July 1945, **1925**
Génin, G., dry batteries, **1769**; recent improvements in Leclanché cells, **1171**
Gent, A. W., principles of v.m., **893**
George, E. E., testing loudspeaker magnets, **473**
George, W. W., WWV standard-frequency broadcasts, **171**
Gerber, W., and F. Tank, high-altitude radio stations and links, **546, 2632**
Gerdien, H., and W. Schaaffs, mechano-piezoelectric generator for pulses and short time intervals, **2570**
Gerhardt, J. R., and W. E. Gordon, over-water microwave-propagation forecasting, **2330**
—— with A. W. Straiton, horizontal angle-of-arrival measurements for λ 3.2 cm, **3225**
Germany, L. W., and D. I. Lawson, cm-λ link for remote radar displays, **3519**
Gernsback, H., miniature valves, **1208**
Gerszonowicz, S., theory of long transmission line, **2444**
Gevers, M., relation between power factor and permittivity, **1060**
—— and F. K. du Pré, power factor and permittivity temperature coefficient of solid dielectrics, **1059**
Geyger, W., cathode amplifier, **1887**; inverted valve voltmeter, **2848**; magnetic voltage stabilizers, **3256**
Gheri, H., and R. Steinmaurer, 27-day period of cosmic rays, **716**
Ghosh, S. N., night-sky spectrum, **3411**
—— with others, abnormalities in F region at Calcutta, **2522**
Giacoletto, L. J., multitone a.m. and f.m., theory, (D) **2403**; network response to f.m. wave, (D) **674**; resistive terminations for filters, **386**
Giacomini, A., measurement of wavelength of ultrasonic wave, **1846**; ultrasonic cell for modulation of light, 1847
Gião, A., magnetic field inside the earth, **1634, 2776**; magnetic moment of rotating bodies, **1023**
Gibson, A. F., with G. F. J. Garlick, luminescence of phosphors, **2801, 3421**
de Gier, J., and A. P. van Rooy, improvements in c.r. tube construction, **2669**
—— with others, home projection television, **2387**
Gill, E. W. B., and A. von Engel, starting potentials of h.f. gas discharge, [illegible]**906**
Gill, P. S., M. Schein and V. Yngve, cosmic rays, latitude effect, **714**
Gillam, G. H., stabilized insulators with semiconducting glazes, **444**
Gillard, G., starting of oscillations in RC generators, **3047**
Gillett, G. D., effect of circulating currents on broadcast directive aerial efficiency, (A) **2443**
Gilloux, H., l.f. medium-power amplification, **1321**; new tube for colour television, **3531**; technical novelties at Paris fair, **3573**
Giloteau, —, and — Raymond, television reception tests, **1798**
Giniaux, G., applications of rimlock and Mazda-medium valves, **3552**; components exhibition, Paris, 1948, **3075**; developments in French receiving valves, **603, 2664**; radio receivers for motor vehicles, **242**
—— and J. Rousseau, receivers at 1948 Paris fair, **3231**
Ginsburg, V. L., Chernikov's effect and radio wave propagation, **1132**; emission of microwaves and absorption by air, **594**
Ginzton, E. L., W. W. Hansen and W. R. Kennedy, linear electron accelerator, **2584**
—— and others, distributed amplification, (A) **2475, 3375**
—— with others, microwave impedance bridge, (A) **2552**
Giordano, A. B., microwave absolute attenuation standard, (A) **2443**
Giovanelli, R. G., enhanced microwave solar radiation, **2230**
Gisolf, J. H., W. de Groot and F. A. Kröger, absorption spectra of ZnS and willemite, **3424**
Gittins, J. F., with P. G. R. King, skiatron, **888**
Givelet, A., photon and particle counters, **1423**
Givens, M. P., parallel-T network, **971**
Gladwin, A. S., f.m. waves, energy distribution in spectrum of, **3541**, network distortion of, **1294**; harmonics in oscillators, **1583**
Glauber, J. J., with others, cyclophon beam-switching tube, **883**; triode for 600 Mc/s, **877**
Glazier, A. W., transient response of symmetrical quadripoles, **1611**
Gleadle, G. H. M., ionospheric disturbances, **2885**
—— with H. Stanesby, prediction of optimum transmission frequencies, [illegible]**15**
Glikman, S. E., cathode followers in power amplifiers, **3060**
Glinski, G., aerial design theory for f.m., **955**; circular loop aerials with non-uniform current distribution, **34**
Glover, D. W., and R. L. Bull, silicones, **1056**
Glucksman, H. A., superregeneration, analysis of linear mode, (A) **2596**
Goedhart, D., with others, 48-channel carrier telephone system, **2356**
Goffard, S. J., with others, effect of limiters and selectivity on receiver performance, **814**
Gold, T., with R. J. Pumphrey, degree of resonance of human ear, **8**; resonance theory of hearing, **3003**
Goldberg, H., and E. L. Crosby, Jr, series-mode crystal-oscillator circuits, [illegible]
—— with R. G. Talpey, microwave frequency standard, **483**
—— with others, tuner-amplifier for television receivers, (A) **2647**
Goldman, S., noise reduction theory for radar and communication, **2903**
Goldmark, P. C., and others, instantaneous radio audience-measurement system, (A) **2430**
Goldsmith, A. N., theatre television, **2944**
Goldsmith, T. T., Jr, and R. P. Wakeman, field coverage of New York television stations, (A) **2647**
Gonorovski, I. S., frequency modulators with reactance valves, **2406**
Good, E. F., dynamic mutual conductance of valves, (D) **1079**
Good, P., stardardization, **900**
Goodall, W. M., pulse-code modulation for telephony, **545**; remodulating repeater, **2917**
Goode, J. T., negative-feedback compressor, **2158**
Goodell, J. D., dynamic noise suppressor, **1233, 2147**
Gooden, J. S., H. H. Jensen and J. L. Symonds, theory of proton synchrotron, **209**, (C) **507**
—— with others, 1000-MeV proton synchrotron, **208**
Goodman, B., diode noise generator, **490**
Gootee, T., t.r. switches for amateur installations, **2376**
—— with L. S. Wecker, television receiver construction using BC-412 c.r.o., **303**
Gordon, D. S., with others, cm-λ and dm-λ power measurement, **2022**
Gordon, H., with others, Berkeley 4-MeV e.s. generator, (A) **2311**; design of Berkeley linear accelerator, (A) **2316**
Gordon, J. F., valve pickup for lateral records, **1820**
Gordon, T. M., Jr, top-loaded aerials, **1278**
Gordon, W. E., theory of radar reflections from lower atmosphere, (A) [illegible]
—— with J. R. Gerhardt, over-water microwave-propagation forecasting, **2330**
Gordon-Smith, A. C., with L. Essen, velocity of e.m. waves, **3488**
Gordy, W., and M. Kessler, electronic system for detecting microwave spectra, **405**
Gorelik, G. S., radiophysics and theory of automatic control, **402**
Gorozhankin, B. N., interaction of two oscillators, **361**
Gorter, C. J., and B. Kahn, theory of gyromagnetism, **3092**
Gosmand, R., f.m./a.m. transmitter, **586**; television receiver, **1795**
—— with R. Aschen, l.f. cinematic analyser, **2002**
Gottlieb, I. M., oscillator for 8800–9500 Mc/s, **982**
Goudet, G., e.m. radiation formula, **340**
—— and A. M. Gratzmuller, electron beam divergence due to space charge, **1812**
—— and R. Musson-Genon, electron trajectories and space charge effects, **1811**
Gough, D. I., with A. L. Hales, underground magnetic field and Blackett's theory, **1635**
Gould, W. B., radar reflections from lower atmosphere, (D) **722**
Gouriet, G. G., noise characteristics of pulse-length-modulated system, **2606**
Goutelle, J., with R. Aschen, h.f. beat-frequency oscillator, **1584**
Gow, J. D., with others, linear-accelerator oscillator and coupling system, (A) **2318**
Goward, F. K., end-fire arrays, **1271**
Grace, A. C., field-strength measurement at 400–4000 Mc/s, **1685**
—— with J. A. Saxton, cm-λ field-strength meter, **2029**
Grainge, A., a.c. operated triodes, **2980**
Grainger, E. J., with W. P. Anderson, communication equipment in British Navy, **2084**
Grammer, G., television interference from amateur transmitters, **579**
Granger, J. V. N., current distribution on aircraft structures, (A) **2552**
Granier, J., dielectric losses, **2821**
Granovski, V. L., and T. A. Suetin, oscillations in low-pressure discharge, **1347**
Grant, E. F., response of N-stage amplifier, **3062**
Grassot, P., prototype filters, **999**
Gratzmuller, A. M., with G. Goudet, electron beam divergence due to space charge, **1812**
Gray, M. C., and S. A. Schelkunoff, approximate solution of differential equations, [illegible]
Green, H. C., with others, Visible Speech, (B) **2713**
Green, R. L., and K. B. Blodgett, electrically conducting glasses, **3437**
Greene, W. E., magnetic amplifiers, **198**
Greenough, M. L., electronic micrometer, **1129**; tuning eye as polarity indicator, [illegible]
Greenwood, H. W., powder metallurgy, **151**; Ti technique for glass/metal seals, (A) **2300**
Gregoretti, G., valve characteristics by extrapolation, **2105**
Gregory, G., with C. F. Booth, comparison of standard frequencies, and Doppler effect, **1723**
Gregory, G. S., with H. R. Smith, film pickup system, **2945**
Greig, J., and H. Kayser, iron loss measurements, (A) **1082**
Grekhova, M. T., and others, instruments for measurements at cm λ, **475**
Grieg, D. D., pulse-count modulation, **544, 2822**

—— and H. Gallay, pulse-time-modulated multiplex radio relay system, 548
—— J. J. Glauber and S. Moskowitz, cyclophon beam-switching tube, 883
—— S. Metzger and R. Waer, communication by reflection from moon, (A) 547, 2915
—— with S. Moskowitz, noise-suppression characteristics of pulse-time modulation, (A) 531, 2607
—— with others, distortion in pulse-code modulation, (A) 2281
Grieveson, J. H., and A. M. Wiggins, comparative decibel meter, 1094
Griffiths, H. V., S. E. Martingell and R. W. Bayliff, meteor whistles, 3403
Griffiths, J. H. E., war-time development of valves, 2101
—— with others, signal generators for cm-λ noise factor measurements, 2026
Grigorash, U. L., with others, instruments for measurements at cm λ, [illegible] 475
Grillet, L., capacitance meter with neon-lamp indicator, 3182
Grimm, R., comb aerials, 2169
Grimmet, L. G., with W. B. Mann, Imperial College h.v. e.s. generator, 199
Grimshaw, L., with N.T.J. Bevan, amateur R/T on 2350 Mc/s, 3248
Grisdale, G. L., and R. B. Armstrong, design of communication receivers, (D) 1457
Grisdale, R. O., and M. D. Rigterink, porcelains with low dielectric loss, (A) 445
Grivet, P., C.S.F. e.s. electron microscope, 3209; Giorgi system of units, 1007
—— with H. Bruck, improvements in C.S.F. e.s. microscope, 212
—— with others, resolving power and objective defects in electron microscope, 214
Gronberg, H. C., with R. W. Clark, television studio technique, 1783
de Groot, W., luminescence decay for ZnS phosphors, 3423; optical aberrations in lens and mirror systems, 2767; rise and decay of luminescence, 3130
—— with others, absorption spectra of ZnS and willemite, 3424
Gross, A., printed receiver circuits, (A) 1614
Gross, F. J., aircraft course computer, (A) 2524
Grover, G. M., with others, design of synchrotron magnets, 1121
Gruen, H., with others, propagation in 2-dielectric coaxial lines, (A) 2166
Grünberg, G. A., electron focusing by e.s. and e.m. fields, 81
Guénard, P., with others, effects of space charge in 2-cavity klystron, 612
Guenther, J. H., with W. M. Jurek, a.g.c. and limiting amplifier, 69
Guha, U. C., with others, ionospheric propagation of e.m. waves, 1442; microwave radiation from sun, 2229
Gulbransen, E. A., and W. S. Wysong, oxide films, on Mo, 742, on W, 743
Guldimann, A., transoceanic R/T, 1750
Gundlach, F. W., resonance excitation by electron streams, 2970
Gunka, H., and W. Lippert, note location on magnetophon tape, 1852
Gurevich, S. B., absorption of ultrasonic waves in liquids, 3
Gurin, H. M., broadcasting-studio pickup technique, 1539
Gusev, V. D., effects of ionosphere inhomogeneities, 420
Gutkin, L. S., superregenerative receiver, 1738; theory of diode frequency changer, 3233
Gutmann, P., dynamic mutual conductance of valves, (D) 1079; valve voltmeter, 477, (D) 1086
Güttinger, P., Frequency Modulation, (B) 2087
Gutton, H., radiators for cm waves, (A) 31
—— and J. A. Ortusi, u.h.f. modulation on waveguides, 54
Guttwein, G., distortion in sound disk apparatus, 16
Guyot, G., loudspeakers in transient regime, 3009
—— with — Chamagne, measurement of valve background noise, 489; synchronization of low-power transmitters, 3272
Guyot, —, with — Chamagne, 6-channel multiplex broadcasting equipment, [illegible]
Gvozdover, S. D., and E. M. Moroz, oscillations in magnetron with Lecher system, 1516

H

Haantjes, J., and F. Kerkhof, home projection television, 2387
—— and B. D. H. Tellegen, diode as converter or detector, 3360
Haas, F., l.f. analyser, 1403; voltohmmeter, 1686
Haayman, P. W., with others, semiconductors with large negative temperature coefficient of resistance, 2265
Hacke, J. E., Jr, approximate solution of ionosphere absorption problem, 3115
—— and A. H. Waynick, restricted-range sky-wave transmission, 3220
Hackley, R. A., with others, underwater sound transducers, 1542
Hacks, J., apparatus for locating iron in timber, 3212
Hadfield, B. M., amplifier load-impedance reduction, 3063
Haefely, G., plastics in electrical industry, 452
Haeff, A. V., memory c.r. tube, 319
—— T. E. Hanley and C. B. Smith, wide-range u.h.f. signal generators, 776
Hahn, W. C., and J. P. Blewett, electron trajectories by differential analyser, 2408
Haine, M. E., Metropolitan Vickers electron microscope, Type EM2, (A) 211, 2041
—— with others, triggered spark-gaps for high-power modulators, 833
Hale, D. H., h.f. breakdown of gases, 3085
Hale, D. R., growing of quartz crystals, 3433
Hale, H. E., and H.P. Mansberg, oscilloscope camera, 2931
Hale, N. H., f.m. broadcast transmitters, 850
Hales, A. L., propagation of tail component of atmospherics, 2888
—— and D. I. Gough, underground magnetic field and Blackett's theory, 1635
Hall, H. H., with H. C. Hardy, transient response of loudspeakers, (A) 3331
Hall, J. S., L. A. Turner and R. M. Whitmar, Radar Aids to Navigation, (B) 2255
Hall, L., ultrasonic absorption in water, 2774
Hall, L. L., with others, radio transmitting station at Criggion, 2371
Hall, W. C., e.s. dischargers for aircraft, 530
Hallborg, H. E., with others, sunspots and radio weather, 3106
Halliday, D. F., and D. G. Kiely, dielectric-rod aerials, 3350
Hallman, L. B., Jr, design of universal beacon system, (A) 2524
Hallmark, C. E., and R. D. Brooks, wide-band oscilloscope amplifier, 64
Hallows, R. W., Ruben-Mallory Hg cell, 2645
Halsey, R.J., and J. Swaffield, vocoder telephony system, (A) 2910
Hamaker, H. C., radiation and heat conduction in light-scattering material, 394
—— H. Bruining and A. H. W. Aten, Jr, effect of degassing procedure on oxide cathodes, 2415
Hamberger, L., and K. Rawer, s.w. propagation round the earth, 3216
Hamburger, F., Jr, with W. R. Garner, minimum signal and target separation on remote projection p.p.i., 731
Hamburger, G. L., interference measurement, 1701
Hamer, W. J., shelf life of dry cells, 2933
Hamilton, D., Admiralty Type 612 transportable equipment, 2360
Hamilton, D. R., J. K. Knipp and J. B. H. Kuper, (Eds), Klystrons and Microwave Triodes, (B) 3570
Hamilton, G. E., television transmitter design, 2948, 3532; WABD television aerial, 30
—— and R. K. Olsen, WTTG television aerials, 653
Hamilton, J., quantum theory of radiation damping, 2223
Hammerschmidt, A. L., abacs for microwave relay calculations, 2894
Hammerton, T. G., with others, microwave communication link, 549
Hammond, R. E., with S. H. Simpson, Jr., facsimile standards, 1772
Hanchett, G. D., Jr, electronic circuit breaker, 279
Hanley, T. E., with others, wide-range u.h.f. signal generators, 776
Hansel, P. C., instant-reading direction finder, 2526
Hansen, W. W., surveying with pulsed light, 3211
—— with E. L. Chu, theory of disk-loaded waveguides, 1253
—— with others, linear electron accelerator, 2584
Hanson, A. O., with L. Bess, electron current in 22-MeV betatron, 2586
Hanson, G., with others, v.h.f. aerials for naval communications, 3341; v.h.f. cross-channel communication, 3497
Harding, J. P., and J. F. Harmon, reconstruction of Leafield masts, 565
Hardy, A. E., television white screen and I.C.I. colour system, 570
—— with R. E. Johnson, long-persistence screens, 1653
Hardy, E., frog and electrical science, 903
Hardy, H. C., and H. H. Hall, transient response of loudspeakers, (A) 3331
—— with F. G. Tyzzer, felt, for reducing noise and vibration, 929
Harmans, J., design of wide-band amplifiers, 1889
Harmon, J. F., with J. P. Harding, reconstruction of Leafield masts, 565
Harradon, H. D., bibliography of terrestrial and cosmic magnetism and electricity, 1918
Harrington, E., and W. Bartell, f.m. adapter for a.m. receivers, 1458
Harris, C. M., acoustic impedance of porous screen, (A) 2134, 3310
Harris, E. J., cathode-follower operating conditions, 1316; measurement of small d.c., 164; stabilizing power supplies, 2934
—— and P. O. Bishop, electro-encephalograph amplifier, (D) 1128
Harris, H. E., design of iron-core toroids, (A) 2475; negative-resistance Q multiplier, (A) 2475
Harris, J. D., pitch discrimination in masking, 926
Harris, N. L., with others, electronic switches for single-aerial working, 2643
Harris, W. A., noise theory and receiver design, (A) 2596
Harrison, A. E., Klystron Tubes, (B) 617; ½-MV cavity resonators, (A) 2475
Harrison, E. G., with L. F. Bates, temperature changes in magnetization, of iron, 2805, of some alloys, 2804
Harrison, L. H., with others, emergency communications in mines, 2367
Harrison, T. R. P., impulse testing plant, 469, 1402
Hart, E. D., pulse modulation of signal generators, 1699; standard terms and abbreviations, 2428
Hartman, L. M., theory of h.f. gas discharges, 1904
—— with H. Margenau, theory of h.f. gas discharges, 1903
Hartmann, J., fundamentals of measurement technique, 390
den Hartog, H., and F. A. Muller, c.r.o. timebase circuit, 685
Hartree, D. R., Calculating Machines—Recent and Prospective Developments, (B) 464
—— J. G. L. Michel and P. Nicolson, tropospheric refraction, 2044
Hartshorn, L., with N. R. Campbell, experimental basis of electrostatics, 1909
Harvalik, Z. V., electronic eyepiece for infra-red spectroscopy, 3196
Harvard University, Computation Laboratory, Tables of the Bessel Functions of the First Kind, (B) 463, (B) 1396
—— Cruft Laboratory Staff, Electronic Circuits and Tubes, (B) 2222
—— Radio Research Laboratory, Very High-Frequency Techniques, (B) 2117
Harvie, R. B. R. S., theory of centimetric linear arrays, 2452
—— with others, travelling-wave accelerator for electrons, 506
Hass, Z. K., linear frequency deviation in a wide-band f.m. system, 2656
Hasted, J. B., mμs-pulse generation by electron bunching, 2745
—— with others, dielectric constant of polar liquid at cm λ, 1991; dielectric properties of water and heavy water, 79, 2508
Hastings, A. E., indicator for low a.f., 5
Hatfield, L. E., frequency-shift keying, 2405
Hatton, J., with others, transmission-line diode as cm-λ noise source, 2073
Haubert, A., fine structure of atmospherics, 2520
—— with others, solar effect on ionosphere, 3110
Hausman, L. F., and M. Schwarzschild, integration of differential equations by use of punched-card machines, 1667
Hausner, H. H., metal ceramics, 2828; semiconducting ceramics, 752; sintered semiconductors, 1659
Hawley, M. S., with F. F. Romanow, rating of microphones and loudspeakers, 324
Hayes, A. E., Jr, capacitive pickup with high a.f. output, 632; improved ratio detector, 1476
Haynes, N. M., bibliography of magnetic recording, 642; factors influencing studies of listeners' preferences, 635
Head, J. W., thickness gauge for moving sheets, 2582
Head, L. R., tuning in receivers at 30–180 Mc/s, 2761
Head, R. B., c.r. tube screens, 1212; luminescence of simple oxide phosphors, 3420
Heagy, M. S., with C. Shulman, theory of travelling-wave valve, 2103, (C) 3274
Heald, E. T., with others, aircraft instrumentation and control, (A) 2524
Heaton, V. E., crystal clock for National Bureau of Standards continuous time signals, 2276
Hector, L. G., continuous-exhaust machine for valve manufacture, (A) 2663
Hedeman, W. R., Jr, multi-frequency crystal control, 2342
Heeroma, H. H., standardization of p.m. nomenclature, 3249
Hegbar, H. R., with C. L. Cuccia, u.h.f. low-pass coaxial filter, 1613
Heightman, D. W., propagation near 50 Mc/s, 1451; rebound scattering from F_2 layer at λ 10 m, 520
Heinrich, J. M., capacitance bridge, 168
Heins, A. E., and H. Feshbach, coupling of two acoustical ducts, 911
Helber, C., design of saturable reactors, 2181
Helfrich, H. D., Jr, wide-deviation reactance modulator, 2489
Heller, D. M., and L. C. Stenning, crystal-controlled v.h.f. equipment, 2616, (D) 3509
Helliwell, R. A., measurement of ionospheric virtual height at 100 kc/s, 1946
Helterline, L. L., Jr, a.c. voltage stabilizer, 831; nobatron stabilized d.c. power supply, 284; voltage regulation in broadcasting stations, 1170
Hémardinquer, P., French multi-cell television screen, 838; improvements in television cameras, 291
Henderson, S. T., with others, c.r. tube screens for radar, 885
Hendriquez, V. C., frequency characteristics of receivers, 1461
Hendrix, W. C., with others, Description of the Earth's Main Magnetic Field and Its Secular Change, 1905–1945, (B) 1645
Henry, J., s.w. band-spread coil design, 3069
—— with D. Chervet, correction formula for frequency of Helmholtz resonators, 2998
Herbert, L., with H. de B. Knight, enclosed spark-gap for overvoltage protection, 832; Hg-vapour thyratrons for radar modulators, 879
Herborn, L. E., conductance-unbalance bridge, 2562
Herbst, J. A., with others, tests on navar system, (A) 428
Herbstreit, J. W., and J. R. Johler, cosmic noise at 110 and 25 Mc/s, 2510
Hercock, R. J., Photographic Recording of Cathode-Ray Tube Traces, (B) 2382
Hereford, F. L., Jr, acceleration of electrons by resonant cavity, 1431
Herlin, M. A., and S. C. Brown, breakdown of gas at microwave frequencies, 3390
Herlofson, N., radio echoes from aurora, 2244; theories of meteor ionization, 3401
Herman, L., with others, infra-red band in night-sky light, 1644
Herman, R., L. Herman and J. Gauzit, infra-red band in night-sky light, 1644
Herreng, P., and J. Ville, impedance irregularities of coaxial cables, 2162
—— with R. Blondé, high-speed level recorder, S.A.C.M. Type 2128, 1060
Herrnkind, O. P., Hivac miniature valves, 2982; VCH 11 triode-hexode and VF 14 pentode, characteristics, 1818
Hershberger, W. D., and L. E. Norton, frequency stabilization with microwave spectral lines, (A) 2475, 2953
Hershey, L. M., design of timers for a.m. and f.m., 236; r.f., i.f. and a.f.c. circuits, (A) 237
Hershfield, S., tapered coaxial junctions, 948
Hertwig, H., frequency-constant a.c. source, 1767; sawtooth oscillations, 3056; thyratrons and applications, 2108
Hertzler, P. H., crystal-controlled mobile transmitter for 144 Mc/s, 852
Herzog, W., band-, high- and low-pass filters, 2499; crystal band-stopper circuits, 3071
Hess, H. A., s.w. echo signals, 2063, 2889, 3214, 3215, 3216, 3495, 3496
Hewitt, F. J., J. Hewitt and T. L. Wadley, frequency prediction for South Africa, 229
Hewitt, J., with others, frequency prediction for South Africa, 229
Hewlett, C. W., cosmic rays, 2787
Hewlett, W. R., with W. J. Warren, intermodulation method of distortion measurement, 2553
—— with others, distributed amplification, (A) 2475, 3375
Hey, J. S., ionization effects of meteors, 92
—— and G. S. Stewart, radar observations of meteors, 411
—— S. J. Parsons and F. Jackson, reflection and refraction of cm waves over ground, 519
—— S. J. Parsons and J. W. Phillips, effect of solar activity on D-layer ionization, 413; galactic r.f. radiation at 64 Mc/s, 1926
—— S. J. Parsons and G. S. Stewart, radio observations of Giacobinid meteor shower, 1946, 2781
Heymann, O., electrical differentiation and integration, 2271
Hibbard, F. H., with W. P. Mason, absorbent walls for sound-measurement tanks, [illegible]
Hibbard, L. U., with J. H. Piddington, timebase for radar range measurement, 2468
Hibberd, R. G., absorption wavemeter for 250–850 Mc/s, 1691; wide-band signal generator for 10–100 Mc/s, 1698
—— J. H. Shankland and A. Bruce, p.m. signal generator for 260–800 Mc/s, 1697
Hickey, H. S., with W. C. White, leak detector for pressure system, 2866
Hickey, J. S., with W. C. White, leak detector for pressure system, 2303
Hickin, E. M., with H. Archer-Thompson, radio technique and apparatus for studying cm-λ propagation, 2028
Hickman, J. B., military radio communications, 2083, (D) 2633
Hicks, L. S., amplifier for wire recorder, 2155
Hide, G. S., with others, 1000-MeV proton synchrotron, 208
Higgins, R. J., 1-kW transmitter, 1801
Higinbotham, W. A., J. Gallagher and M. Sands, Model-200 pulse counter, 1105
Hill, A. V., short-period moving-coil galvanometer, 3175, 3456
Hill, C. J. W., with R. D. A. Maurice, B.B.C. monitoring service, 249
Hill, E. G., effect of thunderstorms on television, 232
Hill, R. D., electron accelerator with air-cored field, 206
—— with L. H. Martin, A Manual of Vacuum Practice, (B) 3157
Hilliard, J. K., diacone loudspeaker, 937
Hills, E. G., cathode-follower aerial arrays, 2171
Hilton, P. J., effect of fluctuation noise on pulse distortion, 2351
Hings, D. L., static-free systems of detection, (A) 2596
—— and W. W. Garstang, noise-neutralization detector, 1487
Hintenberger, H., effect of gases on PbS layers, 3148
Hirst, D., and R. W. Hogg, standing-wave indicators for waveguides, 3468
Hoather, W. H., principles and design of aircraft instruments, 2883
Hobbs, M., limiters and frequency detectors, (A) 237
Hobson, P. T., magnetic recording, 943
—— E. S. Chatt and W. P. Osmond, magnetic properties of fine wire, 1083
Hochgraf, L., subscriber terminal for rural carrier telephone, 1490
Hocker, J. P., spark oscillators for glass welding, (A) 2574
Hodelin, J. A., wide-band power amplifiers, 2754
Hodge, W. F., emission of oxide cathodes, (A) 2104
Hodsman, G. F., with G. Eichholz, h.f. permeability of ferromagnetic materials, 136
Hodson, A. L., reduction of insensitive time in G-M counters, 1425
Hoffman, R. B., and E. W. Markow, mobile f.m. communication equipment, 274, 556
Hogg, B. G., vacuum properties of synthetic dielectrics, (A) 122
—— and H. E. Duckworth, vacuum properties of synthetic dielectrics, [illegible]
Hogg, R. W., with D. Hirst, standing-wave indicators for waveguides, 3468
Hok, G., thickness/shear vibrations of thin anisotropic plates, 3384
Hole, N., statistical analysis of counter data, 462
Hollabaugh, M. G., J. A. Rado and A. M. Levine, feedback amplifiers, (A) 232
—— with A. M. Levine, broad-band amplifiers, 378
Hollinghurst, F., and C. W. Sowton, v.h.f. point-to-point communication, 2080, (D) [illegible]
Hollis, W. S., receiver for citizens' radio service, 2341; transmitter for 460–470 Mc/s, 855
Hollway, D. L., reflex klystron manufacture in Australia, 1519
Hollywood, J. M., mismatch loss chart for transmission lines, 1557
Honnell, M. A., 1-kW f.m. broadcast station, 269
—— and J. D. Albright, f.m. aerial patterns by means of models, 2463
Hood, I. A., with S. A. Lott, precision beat-frequency oscillator, 2568
Hopfer, S., with others, geometry for ridged waveguide, (A) 2443
Hopkins, H. F., and N. R. Stryker, loudness-efficiency rating of loudspeakers, 2152
Hopkins, R. J., with H. F. Miller, new kraft capacitor paper, 1384
Hopkinson, R. G., c.r. tube screens, actinic properties, 886, characteristics, 884; visibility of c.r. tube traces, 889
Hopper, A. L., and S. E. Miller, design of radar i.f. amplifier, 690
Horlacher, A. F., stepping switch for control applications, 2881
Horner, F., loop aerials, 3354
Hotine, L., broadcasting the royal wedding, 2082
Houck, G., controlled power supplies for heavy d.c., 2380; gain chart for cathode followers, 63
Hough, J. M., with N. Corcoran, combined polar diagram of aerial, flat earth and screen, 2462
Howatt, G. N., R. G. Breckenridge and J. M. Brownlow, ceramic sheets for capacitors, 146
Howe, A. B., with others, parallel operation of high-power broadcasting transmitters, 3540
Howe, G. W. O. See Anon., G.W.O.H.
Howell, W. D., with others, p.p.i. circuits, 1005
Howland, A. V., design and construction of universal meter, 193
Hoyle, F., with others, structure of solar atmosphere, 2785
Hoyle, W. G., circuit design for gas-discharge regulator valves, 2972; shunt voltage regulators, 3254
Hoyler, C. N., with others, Radio-Frequency Heating, (B) 221
Hubbard, J. C., I.F. Zartman and C. R. Larkin, ultrasonic fields near diffracting edges, 3297
—— and others, distortion of ultrasonic waves, 2999
Huber, G. H., space diversity reception in California, 537
Huber, P., with E. Baldinger, resolving power of counter tubes, 1424
Huber, W., electronic preservation of food, 2325
Hudes, I., with M. H. Shamos, design of metal G-M counters, 1102
Hudgins, A., with others, ion source for Berkeley e.s. generator, (A) 2812
Hudgins, C. V., and others, comparison tests for hearing aids, 2711
—— with others, body baffle effects on hearing aids, 1248; Hearing Aids, (B) 2714
Hudson, A. C., abac for efficiency of inductive coupling, 974
Hugenholtz, E. H., impulse-synchronized oscillator, 367
Huggins, W. H., frequency transformations for electrolyte tank, 2182; multi-frequency bunching in reflex klystrons, 2968; non-contacting short-circuits for coaxial lines, 330, 643, 644
Hughes, V. W., with others, ultrasonic delay lines, 2479
Hull, A. W., with others, stabilized airborne magnetometer, 798
Hull, C. R., with J. W. Dungey, coaxial electron lenses, 510
Hullegård, E., with E. Lindholm, electrometer-valve amplifier, 3177
Hulm, J. K., dielectric properties of $BaTiO_3$ crystals, 127
Hum, J., EF50 as crystal oscillator, 981
Hunkins, H. R., with E. M. Ostlund, multichannel radio-wire links, (A) 2614
Hunt, L. B., Rh in engineering, 747
Hunt, L. E., calibrating microwave wavemeter, 485; measurement of f.m. instantaneous frequency, 1681
Hunter, J. L., with F. E. Fox, simplified theory of supersonic interferometry, (A) 2430
Huntington, H. B., ultrasonic propagation through Hg in tubes, 3298
—— A. G. Emslie and V. W. Hughes, ultrasonic delay lines, 2479
—— with others, ultrasonic delay lines, 2479
Huntoon, R. D., and A. Weiss, synchronization of oscillators, 1309
Hupert, J. J., frequency composition in naval communication transmitters, 2278
Hurault, J. L., with others, 12-channel carrier-current system, 1488
Husain, S. A., with others, h.v. measurements, (A) 2561
Hust, L. B., magnetic tape recorder, 2154
Hüter, W., h.f. insulators for high power, 1388
Huth, A., broadcasting and television in U.S.S.R., 535
Hutter, R. G. E., electron beam deflection, 609; field plotting for electron lenses, 1436
Hutton, E. W., thyratron-controlled half-cycle magnetizer, 2543
Huxford, W. S., and J. R. Platt, infra-red communication systems, 2908
—— with others, modulation of resonance lines in Cs arc, 2353
Huxley, L. G. H., Principles and Practice of Wave Guides, (B) 350
Hyde, W. L., with others, Ni bolometers, 194

I

Iams, H. A., R. L. Burtner and C. H. Chandler, stereoscopic viewing for c.r. tubes, 2984
Induni, G., cold cathode electron source, (A) 1434
Infeld, L., aerial theory, effect of finite gap, 24
Ingerslev, F., and W. Frobenius, open organ pipes, 2126
Institute of Radio Engineers, radio progress during 1947, 2994
Ioppolo, G., frequency measurement for m and dm λ, 2004
Isely, F. C., tunable resonant circuits for 300–3000 Mc/s, 3370
Istvánffy, E., crystal filters, (C) 1579; radar developments in Hungary, 1957
Ivanov, B. I., with others, efficiency of valve oscillator, [illegible]

J

Jack, W., sound measurements in broadcasting studios, 3326

Jackson, F., with others, reflection and refraction of cm waves over ground, 519
Jackson, J. D., with L. J. Chu, field theory of travelling-wave valves, 3549
Jackson, W., with others, voltage characteristics of polythene cables, (D) 2841
Jacobus, H. R., with P. I. Corbell, Jr, triodes for 3-kW and 10-kW f.m. transmitters, 876
Jaeckel, R., theory of diffusion pump, 3126
Jaeger, J. C., equivalent path and absorption for oblique incidence on curved ionosphere, 3493
Jaffe, A. A., with J. D. Craggs, discharge spread in G-M counters, 1103
—— with others, G-M counters, 2032
Jaffe, H., piezoelectric coefficients of EDT and DKT, 3134
James, E. G., and others, Army wireless set No. 10, 2624
—— with R. J. Ballantine, wide-range u.h.f. oscillator circuits, 3373
—— with others, common-cathode amplifiers, 2490; u.s.w. triodes and oscillators, 683; valve noise and transit time, 2420
James, E. J., loudspeaker damping, (D) 13
Jamieson, H. W., with J. R. Whinnery, electron trajectories by differential analyser, 2408
Jarman, V. G., valve assembly devices, 867
Jarmotz, P., with R. Pepinsky, h.v. stabilizer, d.c., 3257, inductively coupled degenerative, (A) 278
—— with others, recovery time of G-M counters, 2309
Jarvis, R. F. J., and R. A. Brockbank, multichannel r.f. amplifiers, 2213
Jasberg, J. H., with others, distributed amplification, (A) 2475, 3375
Jasik, H., with A. Alford, reradiation from broadcast towers, (A) 2443
Jauch, J. M., NH_3 inversion spectrum, (A) 90, 707
Jeffers, C., a.m./f.m. facilities at WOAI/WOAI-FM studio, 2924
Jefferson, H., R/T terminals, 1157; standard terms and abbreviations, (D) 2991
Jelonek, Z., noise in pulse communication, 2605
—— and E. Fitch, pulse communication, 2079, (A) 2618
—— with others, carrier frequency-shift telegraphy, 2354
Jen, C. K., microwave spectroscope, 708
Jenkins, J. W., radar C. H. receivers, 809
Jenks, F. A., microwave a.f.c., 847, 1196
Jennings, M. H., with J. R. Day, quadriline power amplifier, 598
Jenny, F., modern transmitting valves, 2967
Jensen, A. S., and others, barrier-grid storage c.r. tubes, 2986
Jensen, H. H., with others, theory of proton synchrotron, 209, (C) 507
Jeppson, M., with others, ion source for Berkeley e.s. generator, (A)2312
Jessell, A. H., consol navigation aid, 2252
Jesty, L. C., H. Moss and R. Puleston, c.r. tubes for radar, (D) 887
Jira, J. W., metal films for resistors and printed circuits, (A) 1614
Job, F., pentodes with variable screen voltage, 1832
Joffe, A. V., resistance at metal/semiconductor contact, 1381
Johler, J. R., with J. W. Herbstreit, cosmic noise at 110 and 25 Mc/s, 2510
Johnson, E. M., with C. E. Smith, performance of short aerials, 651
Johnson, G. W., spraying technique, (A) 1614
Johnson, K. C., single-valve a.f. oscillator, 2203
Johnson, M.P., audio amplifier, 67; pressure/frequency effect of tuning fork, 627; series trimming of crystal resonators, 363
Johnson, R. E., and A. E. Hardy, long-persistence screens, 1653
Johnson, R. H., hard-valve pulse modulators, 863
Johnson, V. A., and K. Lark-Horovitz, low-temperature resistivity of semiconductors, (A) 140
Johnson, W.A., aircraft communication aerial design, 2457
Johnston, D. L., electro-encephalograph amplifier, 680
Johnson, W. G., with others, automatic control in radar receivers, 808
Jolivet, P., electric fields in e.s. generators, 2644
Jolliffe, S. A. W., and D. Watson, h.f. direction finders, 2246
Jones, A. Taber, acoustics bibliography, 908, 1531, 2118, 2684, 3285
Jones, F. C., simple converter-preselector, 247
Jones, F. E., velocity of cm waves over sea, 1441
Jones, H. Spencer, K-indices and sudden commencements at Abinger, 719, 1931; Royal Observatory, Greenwich, 2425
Jones, J. H., with others, common-aerial working for v.h.f. systems, 3520; v.h.f. aerials for naval communications, 3341
Jones, T. J., secondary emission from oxide cathodes, 3551
Jonker, J. L. H., reflection of electrons in valves, 2964
Jordan, E. C., with others, aerial radiation pattern measurements using models, 1276
Jordan, V. L., use of Helmholtz resonators for sound absorption, 1232
Jordan, W. H., and P. R. Bell, linear amplifier, 991
Jouaust, R., effect of wind on radio propagation, 1726; radio and meteorites, 2778
Jouguet, M., properties and applications of oval waveguides, 2720, 2724
Juillet, M., traffic receiver RECRO 451, 264
Julsrud, E., and G. Weider, speech-input equipment for Oslo Broadcasting House, 3008
Jung, H., theory of hearing, 7
Jungfer, H., h.f. amplification, 688
Jupe, J. H., filmgraph sound recording system, 941
Jurek, W. M., and J. H. Guenther, a.g.c. and limiting amplifier, 69
Juritz, J. W. F., and C. B. O. Mohr, cosmic-ray bursts and showers, 416
Jurmain, J. H., tensor analysis applied to elasticity and piezoelectricity, 3083
Juster, F., amplifier with variable bandwidth, 60; oscilloscope for very low frequencies, 1088; RC generator, 50 c/s–1 Mc/s, 979

K

Käch, A., propagation in waveguides near limiting frequency, 333
Kaestle, F. L., 100-MeV betatron power supply, 506
Kafian, C., theory of bridged-T networks, 2735
Kaganovich, V. M., measurement of feeder parameters, 1677
Kahan, T., cavity resonators, effect of electron beam on frequencies, 2483, perturbation method for, 2482
—— and S. Colombo, transient state in waveguides and cavity resonators, 3018
Kahn, B., with C. J. Gorter, theory of gyromagnetism, 3092
Kahnke, J., with others, flat-response single-tuned i.f. amplifier, 2496; wide-range double-heterodyne spectrum analyser, 769
Kammerloher, J., characteristics recorder, 486
Kanberg, H., theory of valves with nonlinear characteristics, 2983
Kandoian, A. G., omnidirectional high-gain aerial for circularly polarized radiation, (A) 2443
—— and R. A. Feisenheld, power loads at v.h.f. and u.h.f., (A) 559
—— and A. M. Levine, u.h.f. multiplex broadcasting system, (A) 540
Kane, J. F., with others, microwave impedance bridge, (A) 2552
Kankovsky, B. T., with others, distortion of ultrasonic waves, 2999
Kanoy, L., control systems for transmitters, 849
Kanta, C., reflection coefficient and phase change for sound waves, 3306
Kantor, M., theory of coil winding, 1332
Kappler, M. O., wide band superheterodyne a.m. tuner, 1472
Kapur, P. L., with others, He-filled G-M counters, 3474
Karnath, J. G., portable recorder-player, 328
Karpovski, D. I., with A. M. Kugushev, high-power u.s.w. valve oscillators, 53
Katchky, M., with H. LeCaine, microwave aerial polar diagram plotter, 32
Kather, E. N., wide-range tuning systems for magnetrons, (A) 2663
Katsenelenbaum, B. Z., i.f. propagation along infinite dielectric cylinders, [illegible]
Katz, M. L., luminescence of alkali-halide crystals, 3128
Katzin, M., quantitative radar measurements, 779
—— R. W. Bauchman and W. Binnian, 3-cm and 9-cm propagation in low ocean ducts, 521
Kaufmann, A., conversion table for electrical units, 3451
Kautzky, R. W., with C. E. Talley, sound reinforcement for theatres, 2697
Kay, H. F., and R. G. Rhodes, $BaTiO_3$ crystals, 126
Kay, R. H., and M. Surdin, transmitter-blocker cells for cm waves, 1768
Kay Electric Co., wide-range sweeping oscillator, 51
Kayser, H., with J. Greig, iron loss measurements, (A) 1082
Kazantsev, A. M., ionospheric layer above F_2 layer, 2242
Keen, A. W., linear sawtooth generator, 2746; television framing signal separation, 2388
Keen, R., Wireless Direction Finding, (B) 1047
Kees, H., design of short receiving aerials, 2726
Keister, J. E., with others, television transmitter design, 1810
Kell, R. D., experimental simultaneous colour television system, 572
Keller, H. B., with J. B. Keller, sound reflection and transmission by spherical shell, 2686
Keller, J. B., and H. B. Keller, sound reflection and transmission by spherical shell, 2686
—— with H. Primakoff, reflection and transmission of sound by thin curved shells, 912
Kemp, J., anomalous attenuation in waveguides, 2446
Kendall, J. T., and D. Yeo, magnetic susceptibility of synthetic mica, 3434
Kennedy, W. R., with others, linear electron accelerator, 2584
Kerkhof, F., with J. Haantjes, home projection television, 2387
—— with G. J. Siezen, home projection television, 2387
Kerr, D. E., u.s.w. propagation, 1727
Kesavamurthy, N., with others, h.v. measurements, (A) 2561
Kessenikh, V. N., structure of ionosphere, 417
Kessler, M., with W. Gordy, electronic system for detecting microwave spectra, 405
Kessler, W. J., and H. L. Knowles, direction finder for storms, 2527
Kettlewell, E., calorimeter for r.f. power measurement at λ 3 cm, 2024
—— W. A. Bourne and C. Chilton, 3-cm spectrometer and mismatch impedance unit, 2017
Keye, W. R., with A. A. Cohen, alteration of digital data in magnetic-drum computer memory, (A) 2548
Kharbanda, S. R., with others, television sound on vision carrier, (D) 2384
Kharkevich, A. A., vibrations of piezoelectric rod, 80
Khastigir, S. R., M. K. Das Gupta and D. K. Ganguli, directional observations of atmospherics at sunset, 1363
—— with D. K. Ganguli, interelectrode capacitances of triodes at u.h.f., 1830
—— with others, inherent noise in receivers, 2349
Khodakov, A. L., with N. S. Novosil'tsev, dielectric properties of $BaTiO_3$ at h.f., 1660
Khokhlov, A. S., with Ya. S. Shur, thermomechanical treatment of ferromagnetic materials, 1052
Khorosh, D. M., Sb-Cs photocells, 1511
Khouri, A. S., printed circuit technique, (A) 1614
Khvustikov, I. A., with T. G. Megrelishvili, twilight observations of upper atmosphere, 3114
Kiebitz, F., coupled oscillatory circuits, 1302
Kiely, D. G., with D. F. Halliday, dielectric-rod aerials, 3350
Kiepenheuer, K. O., m-λ and cm-λ solar radiation, 1920; solar activity and ionosphere, 1629
Kiernan, E. F., telemetering fathom-meter, 502
Kilburn, T., with others, strobes and recurrence-frequency selectors, 987
Kilgore, G. R., beam-deflection control in amplifier valves, 881
King, A. H., with others, high-power pulsed magnetron development, 892, (D) 3566
King, A. P., with others, microwave aerial measurements, 1281
King, P. G. R., and J. F. Gittins, skiatron, 888
King, R., field of λ/2 dipole with tuned reflector, 3027
—— and T. W. Winternitz, cylindrical aerial with gap, 3026
—— with B. C. Dunn, Jr, currents excited on conducting plane by parallel dipole, 1910
—— with C. H. Papas, radiation resistance of end-fire and collinear arrays, 3030
Kinman, T. H., with others, Si–W crystal rectifiers, 687
Kinzer, J. P., and I. G. Wilson, cylindrical cavity resonators, 366
Kirkman, R. A., and M. Kline, TE modes in coaxial cavities, (D) 372
Kiskyras, A., magnetic secular variation, 3112
Kitchen, S. W., fast, noiseless thyratron switch, 3037
Kittel, C., relaxation effects in paramagnetic and ferromagnetic resonance, (A) 131; ultrasonics research and properties of matter, 3300
Kitty, F. J., airport traffic control radar, 114, 1040
Kiver, M. S., FM Simplified, (B) 2638
Klasens, H. A., light from fluorescent screens irradiated by X rays, 437
—— W. Ramsden and Chow Quantie, efficiency of ZnS phosphors, 3422
Kleen, W., with O. Doehler, energy exchange in travelling-wave valves, 602
Kleene, S. C., lengthening of modulated repetitive pulses, 667
Klein, W., and J. Dufour, f.m. u.s.w. broadcasting, 2893
Kleinsteuber, W., and G. Riese, selectivity of broadcast receivers, 3499
Klement, F. D., with S. A. Popok, influence of infra-red rays on CaS-Pb phosphors, 1651
Klemperer, H., and J. T. de Bettencourt, repeller storage tube, 3560
Klemperer, O., space charge and electron emission velocities, 872, (A) 1825
—— and B. J. Mayo, electron optics of electron guns, 3558
Kleynen, P. H. J. A., theory of plane diode, 2977
Kline, H. W., r.f. resistance meter, 3460
Kline, M., with R. A. Kirkman, TE modes in coaxial cavities, (D) 372
Klinger, H. H., microwaves, 2116; properties of mm waves, 1911
Klinkhamer, H. A. W., emergency supply systems, 2378
v. Klüber, H., ionosphere and solar research, 1354
Kmosko, J. A., high-gain array for 144 Mc/s, 345
Knight, H. de B., ignitrons Type BK 22 and BK 24, 3547
—— and L. Herbert, enclosed spark-gap for overvoltage protection, 832; Hg-vapour thyratrons for radar modulators, 879
Knight, S. A., Fundamentals of Radar, (B) 2533; high-fidelity superheterodyne receiver, 1135
Knipp, J. K., with others, Klystrons and Microwave Triodes, (B) 3570
Knock, D. B., 28–54-Mc/s converter, 1736
Knol, K. S., with M. J. O. Strutt, magnetic permeability and Weiss domains, 3089
Knowles, H. L., with W. J. Kessler, direction finder for storms, 2527
Knowles, R., anode-follower circuit, 990
Kobilsky, M. J., loop aerial coupling transformers, 354
—— and J. Tepper, ripple current in half-wave rectifiers, 1503
Kobrak, H. G., conducting material of human ear, 2135
Kobrinski, N. E., and L. A. Lyusternik, calculating machines, 757
Koch, A. R., cavity resonators for 2300 Mc/s, 2199
Koch, H. W., and C. S. Robinson, pulse operation of betatron, 2315
Kock, W. E., metallic delay lenses, 2176, 2465, 3032
—— with others, microwave aerial measurements, 1281
Koerner, L. F., frequency calibration of quartz crystals, 1405
Köhler, J. W. L., and C. G. Koops, time constant of resistors, 3453
Kok, W., with others, sound absorption by porous materials, 2144
Kollath, R., and G. Schumann, 15-MeV betatron, 3207
Koller, L. R., secondary electron emission, 3392
Kolomiets, B. T., preparation of Tl_2S photocells, 1813
—— and S. M. Ryvkin, photoelectric properties of InS and InSe, 1388
Kompfner, P., and others, transmission-line diode as cm-λ noise source, 2073
Kontorovich, M. I., propagation through diaphragm in waveguide, 1252
Koontz, R., with G. S. Carter, test characteristics of recording wire, 3149
Koops, C. G., with J. W. L. Köhler, time constant of resistors, 3453
Kopp, G. A., with others, Visible Speech, (B) 2713
Koppelmann, F., capacitance bridge with rectifier and galvanometer, 3181
Korchagina, E. P., u.s.w. oscillators, 52
Korff, S. A., electronic techniques in nuclear science, 1119; rise of wire potential in counters, 196
Korn, G. A., d.c. analogue computers, 2549; d.c. electronic integrators, 2551
Kornei, O., frequency response of magnetic recording equipment, 19
Kosten, C. W., measurement of sound absorption, 2145
—— and C. Zwikker, absorption of sound, by compressible wall, 3321, 3323; by porous rubber, 3324
—— with others, sound absorption by porous materials, 2144, 3322
Kotomina, L. A., limiting wavelengths generated by a triode, 2665
Kourganoff, V., atmosphere with frequency-dependent absorption, 1638
Krasnushkin, P. E., normal-mode theory of propagation for stratified medium, 3223; normal waves in multipolar ladder filters, 1333
Kraus, J. D., wide-band helical-beam aerial, (A) 2443
Krause, E. H., high-altitude research with V-2 rockets, 1427
Krause, L. O., f.m. broadcast transmitters using phasitron modulation, 591
Krauss, H. L., Class-A push-pull amplifier theory, 1891
Kreer, R. G., with S. Sparks, radiotelegraph tape relay system, 539
Kretzmer, E. R., distortion in pulse duration modulation, 861
Krishnamurthy, C. R., with A. London, feedback method of acoustic impedance measurement, (A) 3307
Kroemmelbein, W. F., shoran for surveying, 2252
Kröger, F. A., applications of luminescent substances, 1973; fluorescence of tungstates and molybdates, 2802; luminescence of solid solutions, 2259; photoluminescence of $(Mg,Zn)(W,Mo)O_4$, 2260
—— and J. Bakker, luminescence of Ce compounds, 3425
—— with others, absorption spectra of ZnS and willemite, 3424
Kron, G., with J. Maginnis and H. A. Peterson, electron trajectories by differential analyser, 2408
Kron, G. E., electronics in astronomy, 3478
Kronenberg, M. H., visual alignment of television receivers, 182
Kugushev, A. M., and D. I. Karpovski, high power u.s.w. valve oscillators, 53
Kuhner, M., ceramic/metal seals, 121
Kunze, F., Data, Characteristics and Connections of German Broadcasting Valves, and Detailed Application Examples, (B) 3569
Kuper, J. B. H., with others, Klystrons and Microwave Triodes, (B) 3570
Kurshan, J., cathode-follower gate circuit, 2206
Kwal, B., particle accelerators, 1711

L

Labadie, M. R., television transmitter power stage, 575
Labin, E., f.m. detection, 2343; frequency-counting circuits as f.m. detectors, 3235; microwave radio relay systems, 550
Labus, J., space charge and phase focusing of electron beams, 3568
Lacy, R. E., with C. E. Sharp, portable microwave communication set, 2914
Lafferty, J. M., design of electron reflectors, 82; v.m. reflex oscillator, 614
Lafferty, R. E., abac for voltmeter loading, 766
Lagemann, R. T., with D. R. McMillan, Jr, ultrasonic interferometer for measuring velocity in liquids, 1226
Lallemand, A., and F. Lenouvel, electronic telescope for stellar photometry, 1714
Lamb, J., dielectric-constant measurement by cavity resonator for λ 1 cm, 1995
Lambert, R., with J. Baurand, pulse method for measurement of small photo-currents, 1672
Lamont, H. R. L., atmospheric absorption of microwaves, 3398
—— and J. A. Saxton, intensity-distance law of radiation, 3492
—— R. G. Robertshaw and T. G. Hammerton, microwave communication link, 549
Lamson, H. W., a.c. measurements of magnetic properties, 2006; dynamic mutual conductance of valves, (D) 1079
Landau, L., electronic plasma vibrations, 1346
Landon, V. D., theoretical analysis of multiplex transmission systems, 3246
Lane, E. S., insulating oil problems, (A) 3143
Lane, J. A., with J. A. Saxton, dielectric properties of water at cm λ, 1912
Langberg, E., super-synchrodyne communication receiver, 2340
Lange, I., with others, Description of the Earth's Main Magnetic Field and Its Secular Change, 1905–1945, (B) 1645
Lange, R. W., measurement of high-Q cavities at 10 000 Mc/s, 2282
Langford-Smith, F., loudspeaker damping, (D) 13
Langille, R. C., with others, measurement of rainfall by radar, 3121
Lanier, R. S., planning f.m. broadcast station, 822
Lankes, L. R., with S. H. Duffield, electronic testing of camera shutters, 3479
Laplume, J., signal reception through noise, 2603
Laporte, L., with others, Description of the Earth's Main Magnetic Field and Its Secular Change, 1905–1945, (B) 1645
Lapostolle, P., with A. Blanc-Lapierre, fluctuations in quasi-sinusoidal quantities, 77
Lark-Horovitz, K., with V. A. Johnson, low-temperature resistivity of semiconductors, (A) 140
—— with W. Scanlon, electrical behaviour of Te, (A) 130
Larkin, C. R., with others, ultrasonic fields, near diffracting edges, 3297
Latham, R., with others, high-power pulsed magnetron development, 892, (D) 3566
von Laue, M., Theorie der Supraleitung, (B) 2509
Lauer, —, — Lesnick and — Matson, Servo Mechanism Fundamentals, (B) 1177
Laver, F. J. M., with C. F. Booth, standard of frequency and applications, (D) 2277
Lavoo, N. T., characteristics of lighthouse triodes at 3000 Mc/s, 878
Law, H. B., short-period frequency comparisons, (A) 481
—— with others, crystal oscillators, 2195
Lawrence, N. Q., architectural design of television station, 582
Laws, C. A., with others, automatic control in radar receivers, 808
Lawson, A. W., with D. Lazarus, temperature controller, 1114
Lawson, A. W., Jr, with R. M. Fano, microwave filters with λ/4-line couplings, 695
Lawson, D. I., A. V. Lord and S. R. Kharbanda, television sound on vision carrier, (D) 2384
—— with L. W. Germany, cm-λ link for remote radar displays, 3519
Lawson, J. D., paraboloid aerial design, 2448; power gain of microwave aerials, 3352
Lawson, J. L., with A. M. Stone, infinite-rejection filters, 385
Lawton, C., and V. H. Winson, colonial telecommunication systems, equipment, 1150, (D) 2907, organization, etc., 1149, (D) 2907
Lax, M., and H. Feshbach, absorption and scattering by spheres and cylinders, 2120
Lay, A. W., physics of industrial diathermy, 1109
Laycock, N., and G. T. Winch, local sensitivity variations of photocells, 2960
Lazarus, D., and A. W. Lawson, temperature controller, 1114
Leas, J. W., surveillance-radar deficiencies and remedies, (A) 2524, 3416
Lebacqz, J. V., r.f. resistance of NbN through transition point, 3135
Lebedev-Karmanov, A. I., and A. M. Pisarevski, modulation system design problems, 1808
LeBel, C. J., audiometry of normal hearing, 1227; charts for cathode-coupled triode amplifiers, 995; listener frequency-range preference tests, critical survey, 11
Lebenbaum, M. T., low-noise receiver input circuits, (A) 2596
—— with R. N. Close, phantastron delay circuits, 2478
Lebert, A. W., with others, pulse-echo measurements on cables, 2295
Leblanc, M., theory of semiconductors and crystal detectors, 87
LeCaine, H., and M. Katchky, microwave aerial polar diagram plotter, 32
Lecointe, M., generator for alignment of television receivers, 1415
Lecolazet, R., electric field in cumulus clouds, 1361
Lee, E., with G. B. B. M. Sutherland, infra-red developments, 3473
Lee, E. M., radio component industry's activities, 1895
Lee, R., Electronic Transformers and Circuits, (B) 2221
Leeds, L. M., with H. P. Thomas, f.m. transmitter performance measurements, 1689
Leffler, J. M., with W. E. Parkins, plasma sheaths as variable capacitors, (A) 2320
Legallais, V., with others, variable capacitor for pressure and displacement measurement, 290
Legrand, C., study of surface layers by X rays, 1055
Legros, R., capacitor discharge through thyratron, 3187
Lehany, F. J., and D. E. Yabsley, solar noise at 600 and 1200 Mc/s, 3103
Lehmann, G., cosmic noise and telecommunications, 2777, 3102; dimensional analysis of v.h.f. triodes, 2978; servomechanisms in radio technique, 3252; v.h.f. triode oscillator and amplifier circuits, 3039
Lehovec, K., theory of barrier layer photoeffect, 3072
Leites, R. D., transients in multi-stage amplifier, 1597
Lejay, P., localization of sporadic-E regions, 3410; m.u.f. determination, 2887
—— A. Haubert and J. Durand, solar effect on ionosphere, 3110
LeKashman, L., 1-kW amateur transmitter, 851
Lemas, R., RC coupling in non-sinusoidal regime, 1303; transitron oscillator, 1879; ultrasonics, 916
Lennartz, A., sensitivity of broadcast receivers, 1468
Lenouvel, F., with A. Lallemand, electronic telescope for stellar photometry, 1714
Leonini, R., long-distance radio propagation, 1446
Leonard, R. W., ultrasonic absorption in fresh and sea water, (A) 2124
Leontovich, M., and V. Fock, cm propagation along earth's surface theory, 1444
Leontovich, M. A., with V. L. Bunimovich, large deviations in electric fluctuations, 1213
Leroy, R., ripple theory, 2180
Leslie, C. B., megacycle stepping counter, (A) 2574, 3477
—— with H. S. McGaughan, resistance-tuned f.m. oscillator for a.f., 368
Leslie, E., c.r. tuning indicator, 1837
Leslie, W. H. P., stabilization of d.c. supplies, (D) 835
Lesnick, —, with others, Servo Mechanism Fundamentals, (B) 1177
Letienne, R., pulse measurement of dielectric constant, 1671
Leutritz, J., Jr, effect of fungi and humidity on plastics, 3153

Lever, W., effect of climatic extremes on Pb/acid batteries, 2932
Leversedge, G. H., radio communication with moving trains, 555
Levi, F., magnetic leakage evaluated with electrolyte tank, 2558
Levin, M. L., reactance of thin aerials, 346; ring resonant slot in waveguide, 3021; theory of slot aerials, 1264
Levin, N., and others, v.h.f. cross-channel communication, 3497
Levin, N. M., with others, auto-electron emission from thin dielectric films, 88
Levine, A. M., and M. G. Hollabaugh, broad-band amplifiers, (A) 378
—— with A. G. Kandoian, u.h.f. multiplex broadcasting system, (A) 540
—— with others, feedback amplifiers, (A) 382
Levine, H., and J. Schwinger, sound radiation from unflanged pipe, (A) 628, 1845
Levitas, D. M., and V. V. Migulin, operation of blocking oscillator, 1880
Levshin, V. L., luminescence of CaS.SrS phosphors, 3127
Levy, M., radar detection of small pulses in noise, 1146, (D) 2899
Lévy, M., spherical waves in dispersive medium, 1617
Levy, M. M., pulse modulation, 2620
—— with others, pulse-testing of wide-band networks, 1101
Lewis, F. S., with A. M. Wiggins, single-shear crystal pickup, 3302
Lewis, N. W., exponential distribution in statistics of valve life, 2836
Lewis, R., 50-W modulator with peak limiting, 1590
Lewis, R. E., and N. McLaren, synthetic sound on film, 2709
Lewis, W. B., radar receivers, 2067
Lewis, W. D., and L. C. Tillotson, branching filter for microwaves, 2216
Lewis, W. H., frequency converters, (A) 2596
Liander, H., C. Schaub and A. Asplund, impact testing of plastics, 1065
Liang, P. H., F_2 ionization and geomagnetic latitude, (D) 1031
Libby, L. L., frequency-scanning v.h.f. impedance meter, 2852; wide-range dual-band television aerial, 3347
Libois, L. J., signal/noise ratio in different systems, spectrum of p.m., 1807
Lichtenstein, R. M., Rochelle salt, electromechanical properties, 124
Licklider, J. C. R., influence of interaural phase on masking, 2140
—— and I. Pollack, effects of distortion on intelligibility of speech, 1537
—— with others, effect of limiters and selectivity on receiver performance, 814
Liebermann, L. N., reflection from coastal sea bottoms, 2687; reflection of underwater sound at sea surface, 3293; ultrasonic absorption in fresh and in sea water, (A) 2125
Liebmann, G., electron microscope, experimental, 2322, resolving power of, 2323
Liebson, S. H., discharge mechanism of self-quenching G-M counters, 495
—— and H. Friedman, self-quenching halogen-filled counters, 3197
van Lieshout, L. J. A., projection unit for television, 2943
Lillicrap, H. G., with others, fading machine, 2299; transmitter drives and receivers for single-sideband systems, 2395
Lilly, J. C., V. Legallais and R. Cherry, variable capacitor for pressure and displacement measurement, 200
Lindenblad, N. E., slot aerials, 1265
Lindenhovius, H. J., h.f. impedance measurement, 470
Lindholm, E., and E. Hullegård, electrometer-valve amplifier, 3177
Lindsay, R. B., sound propagation through simple vortex, 2121
Lindström, G., automatic cyclotron resonance control equipment, 2875; h.f. measurements on cyclotron model, 3480
—— with H. Atterling, h.f. cyclotron generator, 2874
Link, A. E., manufacture of synthetic mica, (A) 448
Liot, L., cavity resonators, 1304; measurement of h.f. power, 3188; substandard generator for m λ, 978; voltage stabilization, 1765; 6L6G as oscillator, frequency doubler, and amplifier, 2202; 25-W, 60-Mc/s transmitter, 590; 5-kW pulse generator, 596
Liot, R., with M. Denis, measurements at cm λ, 1076, 3454
Lippert, W., stereophonic 2-channel transmission with magnetophon, 1229
—— with H. Gunka, note location on magnetophon tape, 1852
Lisman, H., with E. K. Stodola, flat-plate transmission lines as v.h.f. reactors, 2477
Little, G. C., double electrometer valve, 1211
Livens, G. H., magnetic field theories, 3394
Lloyd, P. E., with others, mass and disintegration products of meson, 715
Lockyer, K. G., with L. J. Wheeler, crystal pickups, 918
Loeb, L. B., electrical discharge through gases, 397; mechanism of spark discharge, 3388
—— and W. N. English, point-to-plane corona, (A) 2225
Lofgren, E. J., with others, f.m. cyclotron, 2314
Lombardini, P., multiple-cavity magnetron, 1840
London, A., and C. R. Krishnamurthy, feedback method of acoustic impedance measurement, (A) 3307
Long, H. M., with others, recovery time of G-M counters, 2309
Long, T. H., electronic organ, 2583
Lonsdale, E. M., and W. F. Main, graphical analysis of cathode-degenerated amplifier stages, 374
Lonsdale, K., diamonds as counters, 3399
Loosjes, R., and H. J. Vink, characteristics of oxide cathodes under pulse conditions, 2414
Lorach, M., television in America, 569
Lord, A. V., with others, television sound on vision carrier, (D) 2384
Loria, A., with P. Bassi, scale-of-16 counting circuit, 2185
Lormeau, S., characteristic curves of photon counters, 1021
Loshakov, L. N., and E. B. Ol'derogge, theory of coaxial spiral line, 2715
Lott, S. A., and I. A. Hood, precision beat-frequency oscillator, 2568
—— and H. J. Oyston, 5-inch c.r.o., 2565
Loubser, J. H. N., with B. Bleaney, collision broadening in NH$_3$ inversion spectrum, 3100
Loughlin, B. D., f.m. detectors, 1475; Hazeltine fremodyne circuit, (A) 2596
Lovell, A. C. B., electron density in meteor trails, 1025; meteoric ionization and ionospheric abnormalities, 93, 3402; observations of 1947 Perseid meteor shower, 2511
—— and J. A. Clegg, radio echoes from meteor trails, 2782
—— C. J. Banwell and J. A. Clegg, radio echo observations of Giacobinid meteors, 1946, 2780
—— J. A. Clegg and C. D. Ellyett, radio echoes from aurora, 422
—— with others, radio echo observations of meteors, 2779
Lovell, B., Electronics, (B) 799
Lowde, R. D., scale-of-ten recorder, 1706
Lowry, W. R. H., with W. J. Bray, testing of communication receivers, 2298, (D) 3470
—— with others, transmitter drives and receivers for single-sideband systems, 2395
Loye, D. P., and W. F. Arndt, sheet of air-bubbles as acoustic screen, 2142
Lucantonio, F., carrier-frequency telegraph systems, 1488
Lucas, M. R., scientific work of Paul Langevin, 621
Luck, D. G. C., wide-band phase-splitting networks, (A) 2475
—— with I. Wolff, f.m. radar techniques, 2798, 3124
Ludlow, J. H., with J. M. Dodds, C. H. radiolocation transmitters, 853
Ludwig, J. W., electronic printing control, 789
Lukin, F. V., pulse transformers, 1565
Lukshin, A. A., with Ya. S. Shur, magnetization and magnetostriction curves of alsifer alloys, 1984
Lundberg, C. V., rubber jacket for lead-cased cable, 3015
Luo, Peilin, negative-current voltage-stabilization circuit, 2930
Lurie, W. B., citizens'-band transceivers, 3511
Luz von Gugelberg, H., low-pressure discharges in gases, 398
Luzhinskaya, M. G., with others, effect of rust and recrystallization on soft magnetic materials, 1983
Lynn, J. H., AN/APS-10 airborne radar, 1368
Lyman, B. W., frequency instability of pulsed transmitters, 857
Lyttleton, J. W., with D. Brown, photoelectric Fourier transformer for analysing sound films, 2432
Lyttleton, R. A., with others, structure of solar atmosphere, 2786
Lyusternik, L. A., and A. M. Prokhorov, determination of operator eigenvalues by RC circuit, 457
—— with N. E. Kobrinski, calculating machines, 757

M

Macalpine, W. W., heating of r.f. cables, 3014
Macdiarmid, I. F., a.m. vs f.m., (D) 1160
MacDonald, D. K. C., galvanometer with negative feedback, 476; linear network analysis, 2187
Macfadyen, K. A., vector permeability, 1349
Macfarlane, G. G., impedance of parallel wire grid for oblique incidence, 2589; propagation curves for atmosphere with arbitrary refractive-index profile, 3487
—— and J. R. Whitehead, superregenerative receiver in linear mode, 3501
Machal, A. D., Matrix and Tensor Calculus, (B) 1395
Mackay, D. M., multiple-pulse generator, 984; synchrodyne receiver, (D) 1139
Mackay, R. S., Jr, and R. R. Soule, watch timer, 1669
MacKenzie, K. R., and V. B. Waithman, r.f. system for f.m. cyclotron, 1712
MacLean, W. R., equivalent circuit of resonator transducer, 679
Macnamara, T. C., A. B. Howe and P. A. T. Bevan, parallel operation of high-power broadcasting transmitters, 3540
Macnee, A. B., with others, cascode low-noise amplifier, (A) 2475, 3061
MacNeice, G. G., with A. Elliott, atmospheric transmission at 1–5 μ, 3098
Macro, W. B., with J. L. Putman, slot aerials in corner reflectors, 2467
Madansky, L., and R. W. Pidd, parallel-plate counters, 3200
Maddock, A. J., mechanical model for molecular oscillations, 392
Madella, G. B., filters using modulation, (D) 669; heterodyne analyser with polyphase search voltage, 2013; negative frequency, 1866
Madella-Lucarelli, A., impedance diagrams for parallel resonant circuits, 1376
Maggio, J. B., with others, pulse-echo measurements on cables, 2295
Magnus, F. J., with others, electron trajectories by differential analyser, 2408
Maiden, R. M., abac for selectivity calculations, 1335
Maillard, J., Carson's generalized reciprocity theorem, 2168
Main, W. F., with E. M. Lonsdale, graphical analysis of cathode-degenerated amplifier stages, 374
de Maistre, X., selectivity by negative feedback, 1465
Makai, E., with others, activation of fluorescence by Mn ions, 1375
Makar, R., A. R. Boothroyd and E. C. Cherry, electrolyte tank for a.c. field distribution, 3459
Makinson, W., transducers and intercommunication systems for aircraft, 2458
Malan, D. J., and B. F. J. Schonland, lightning, 1362
Malatesta, S., stability conditions in nonlinear circuits, 1575; voltage induced in receiving aerial, 1268
Malcolm, R. W., taxicab radio equipment, 826
Malich, C. W., with S. L. Seaton, Auroral Research at College, Alaska, (B) 2795
Malling, L. R., aircraft speed by Doppler effect, 782
Maloff, I. G., projection television, (A) 2090; pulsed rectifiers for television receivers, 311
Malov, N. N., attenuation of H_{10} wave in rectangular waveguide, 3016; equivalent circuits for cavity resonators, 3050; wavemeter for cm λ, 3465
Malter, L., magnetic electron multipliers, 796
Mandel, P., large-screen television projector of Compagnie des Compteurs, 2941
Mandeville, C. C., and M. V. Scherb, resolving time and coincidence loss for G-M counters, 2034
Manfredi, D. E., p.m. multiplex communication system, 2359
Mang, C. Y., with O. I. Butler, laminated magnetic cores, effects of overlapping joints in, 1978, magnetic properties of, 1979
Maninger, R. C., reactance-valve circuit analysis, (A) 2475
Mann, W. B., and L. G. Grimmet, Imperial College h.v. e.s. generator, 199
Manners, M., effect of heat treatment on glass/tungsten seals, 119
Mannevy-Tassy, G., resistance variation of MnSb alloy, 2830
Manning, L. A., ionospheric electron distribution, 725
Mansberg, H. P., with H. E. Hale, oscilloscope camera, 2931
Mansford, H. L., waveform monitor, 479
Mansion, D., f.m. detector circuit, 988
Manson, M. W., South African railway communications for royal tour, 2369
Many, W. G., electronic photoflash unit, 1430
Marchal, Y., with N. J. Félici, dielectric strength of compressed gases, 2824
Marchand, N., Ultrahigh Frequency Transmission and Radiation, (B) 1283
Marcuvitz, N., waveguide discontinuities, 3020
Margenau, H., theory of h.f. gas discharges, 1902, 1905
—— and L. M. Hartman, theory of h.f. gas discharges, 1903
Margolin, M. G., f.m. master oscillator for high-fidelity broadcasting, 2402
Mariani, J., magnetism of celestial bodies, 1927
Markham, J. J., analysis of acoustic signals, 2130
Markov, G. T., mutual impedance of aerials, 2174
Markow, E. W., with R. B. Hoffman, mobile f.m. communication equipment, 274, 556
Marks, B. H., ceramic dielectric materials, 3440
Marks, L. W., photographing pulse wave shapes, 288
Marnet, P., attenuation in compound lines, 1556
Marquis, R. J., with others, Hearing Aids, (B)2714; hearing aids, body-baffle effects on, 1248, comparison tests for, 2711
Marshall, F., fluorescent materials irradiated by X rays, 123
Marshall, J. S., R. C. Langille and W. McK. Palmer, measurement of rainfall by radar, 3121
Marsten, J., and A. L. Pugh, Jr, printed resistors, (A) 1614, (A) 2763
Martin, A. E., with R. M. Bowie, spectral power distribution of phosphors, 3426
Martin, A. V. J., Decca navigator, 1646; multiplex links using waveguides, (A) 2078; quartz beat-frequency oscillator, 190; resonant cavities, 2743; waveguides, 2445
Martin, D. W., f.m. receiver design for railway radio, 309
Martin, L. H., and R. D. Hill, A Manual of Vacuum Practice, (B) 3157
Martingell, S. E., with others, meteor whistles, 3403
Marton, L., and K. Bol, spherical aberration of compound magnetic lenses, 216
—— with others, visual observation of patterns recorded on magnetic media, (A) 2430
Marton, L. I., printed conductors, (A)1614
Martyn, D. F., currents causing solar and lunar geomagnetic variations, 1024; lunar tides in the ionosphere, 106; solar r.f. radiation, 2783
Marvaud, J., automatic tracer for electron trajectories, 2009
Maslakovets, Yu. P., with Yu. A. Dunaev, physical properties of PbS, 1656
Mason, L. L., with others, v.h.f. s.w.r. plotting device, (A) 2552
Mason, W. P., BaTiO$_3$ ceramics, 3139; EDT and DKT crystals for filters, 2803; electrostrictive effect in BaTiO$_3$, 1062; synthetic piezo-electric crystals, 740
—— and F. H. Hibbard, absorbent walls for sound-measurement tanks, 3304
Massa, F., sound pressure measurement, 50 c/s–250 kc/s, 3303
Massey, H. S. W., semiconductors, 1068
—— with D. R. Bates, recombination in atmospheric ionized layers, 1944
Mathes, R. C., and R. L. Miller, phase effects in monaural perception, 925
Matricon, M., Allouis OC III transmitting station for 6–21 Mc/s, 553, 2922
Matson, —, with others, Servo Mechanism Fundamentals, (B) 1177
Matte, A. L., multichannel carrier telegraph system, 3245
—— with J. R. Davey, frequency-shift telegraphy, 2382, 2913
Matthews, C., and R. L. A. Borrow, mutual interference in ships of the Royal Navy, 2348
Matthias, B. T., BaTiO$_3$ crystals, dielectric constant and piezoelectric resonance of, 2540, growth of, 2810
—— R. G. Breckenridge and D. W. Beaumont, single crystals of BaTiO$_3$, (A) 125
—— W. Merz and P. Scherrer, dielectric properties of Rochelle-type crystals, 438
Mauchly, J. W., Univac, (A)2548
Maurice, D., and R. J. H. Slaughter, f.m. reception, 2345
Maurice, R. D. A., and C. J. W. Hill, B.B.C. monitoring service, 249
Mautner, L., Mathematics for Radio Engineers, (B) 2274; stabilized power supplies, 285
—— with J. H. Mulligan, Jr, analysis of feedback video amplifier, 2766
—— with R. C. Palmer, video amplifier transient response, (A) 2475
Maxfield, J. P., time integral basis to optimum reverberation time, 3319
Maxwell, D. E., peak limiting amplifiers, 689; visual analysis of a.f. transients, (A) 2552
Maxwell, D. F., broadcast transmission measuring set, 3190
Maxwell, E., conductivity of metallic surfaces at cm λ, 167
Maydanov, A. P., effect of vacuum on magnetron frequency, 1517
Mayo, B. J., with O. Klemperer, electron optics of electron guns, 3558
—— with A. F. Pearce, v.m. reflex valve for λ 10 cm, 897
Mayot, M., forecasting of sunspots, 99
von Mayrhauser, G., vibration-galvanometer improvement, 3452
McArthur, E. D., dyotron microwave oscillator, (A) 2663
McConnell, R. A., video storage by iconoscope mosaics, 836
McCool, W. A., conductance meter for h.f. losses, 3461
McCormack, R. L., standard diode for cathode core-material tests, (A) 2663
McCormick, C. G., glass-sealed switches and relays, 562
McCracken, L. G., filter characteristics of dynamic noise suppressor, 2438
McCready, L. L., J. L. Pawsey and R. Payne-Scott, r.f. solar radiation and sunspots, 412
McDonald, G. J., and D. A. Thorn, radiation from ships' receivers, 2352
McDonald, J. F., W/T transmitters for shore stations, 1804
McElroy, J. C., with others, aircraft instrumentation and control, (A)2524
McGaughan, H. S., unsymmetrical RC parallel-T null network, 47
—— and C. B. Leslie, resistance-tuned f.m. oscillator for a.f., 388
McGee, F., l.f. phase-shift compensation, (A)356
McGraw, R. V., selsyn-driven variable-frequency oscillator, 2744
McGuire, J. H., and F. J. Nowacki, common wave duplex pulse-communication system, 2635
McIlwain, K., lanac navigation system, 1041
—— and H. A. Wheeler, propagation of radio waves through ground, (A) 2590
McIntosh, L. R., with others, e.s. accelerator for electrons, 1120
McKenzie, A. A., a.m. vs f.m., (D) 543
McKinlay, D. W. R., with others, observations of 1947 Perseid meteor shower, 2511
McLachlan, N. W., mathematical theory of f.m., 461; Theory and Applications of Mathieu Functions, (B) 1397
McLaren, N., with R. E. Lewis, synthetic sound on film, 2709
McLaughlin, J. L. A., superheterodyne reception, 811
McLean, D. A., paper capacitors containing chlorinated impregnants, 965
McLean, W., with C. F. Miller, secondary-emission trigger valve NUTR-1032 J, (A) 2663
McMillan, D. R., Jr, and R. T. Lagemann, ultrasonic interferometer for measuring velocity in liquids, 1226
McMillan, E. M., reciprocity theorem, (D) 970
McNally, J. O., and W. G. Shepherd, reflex oscillators for radar, 1518
McNeight, S. A., with others, printed vitreous enamel components, 1603
McPetrie, J. S., and B. J. Starnecki, low-level atmospheric ducts, 2329
McProud, C. G., a.f. gain meter, 3471; h.f. equalization for magnetic pick-ups, 631; intermodulation measurement, 947; volume expander and scratch suppressor, 46; 2-way speaker system, 1850; 6AS7G amplifier, general-purpose, 2756, high-quality, 2755
McSkimin, H. J., theory of Hg delay line, 3367
Meacham, L. A., and E. Peterson, multichannel pulse-code modulation system, 2366
Meacham, S. A., v.h.f. airborne communications system, 828
Meahl, H. R., with G. E. Feiker, direct-reading wavemeter design for λ 2–75 cm, 2293
Means, W. J., with others, airborne magnetometers, 220
Mecke, R., and R. L. Schupp, sensitive capacitance measurements, 2000
—— with R. L. Schupp, valve voltmeter and d.c. amplifier, 3178
Medhurst, R. G., radiation from short aerials, 3348
Medley, D. J., and D. H. Rathgeber, precision double-pulse generator, 3191
Mednikova, N. V., aurora and ionospheric layer above F_2, 2243
Meek, J. H., triple splitting of ionospheric rays, 3221
Meek, J. M., with others, triggered spark gaps for high power modulators, 833
Meeker, W. F., with F. H. Slaymaker, blind guidance by ultrasonics, (A) 2573
Megaw, E. C. S., effects of obstacles on u.s.w. propagation, 2890; high-power pulsed magnetron, development, 891, (D) 3565; permanent magnet design, 753; propagation of very short waves, (D) 2331
—— with J. C. Dix, low-power cm-λ magnetrons, 2987
Megrelishvili, T. G., and I. A. Khvostikov, twilight observations of upper atmosphere, 3114
Meier, A. S., and W. P. Summers, impedance of vertical aerials over finite ground planes, (A) 2443
Meiklejohn, W. H., magnetic hardness-tester, 748
Meinke, H. H., dm-wave measurement technique, 2839; meaning of current, potential and resistance at v.h.f., 3396
Meldahl, A., with L. S. Dzung, units, dimensions and similitude, 2504
Melville, W. S., high-power pulse transformers, 660
Melvin, M. A., theory of automatic control systems, 498
Mendoza, E. B., phase velocity of radio waves over land at 100 kc/s, 1440
Menon, K. B., with others, h.v. measurements, (A) 2561
v. Ments, M., and J. B. Le Poole, computation of magnetic electron lenses, 2321
Menzel, D. H., Elementary Manual of Radio Propagation, (B) 3498
—— and W. W. Salisbury, a.f. radio waves from the sun, 1628
Menzer, E., and K. Sittel, f.m. radiosonde, (B) 2588
Merrill, L. L., and F. H. Slaymaker, directional characteristics of clamped-edge disk, 3288
—— with D. L. Clark, field measurements on magnetic recording heads, 1244
Merriman, J. H. H., and R. W. White, f.m. for v.h.f. multichannel R/T, 3513
Merritt, F. R., with C. H. Townes, Stark effect in h.f. fields, 1344
Merz, W., with others, dielectric properties of Rochelle-type crystals, 438
Mesner, M. H., with others, barrier-grid storage c.r. tubes, 2986
Messiah, A., dynamics of electrons in linear accelerators, 2873
Metson, G. H., wavelength laws of split-anode magnetrons, 1515
Metzger, S., with others, communication by reflection from moon, (A)547, 2915
Metzler, E., and W. Ruegg, broadcasting on l.v. distribution networks, 2613
Meyer, E., G. Buchmann and A. Schoch, sound absorber and sound-damped room, 6
Meyer, H. F., and A. H. Ross, multipath transmission simulator, (A) 2552
Meyer-Eppler, W., display apparatus for transients and nonlinear distortion, 3183
Meyers, A. L., standard terms and abbreviations, (D)2991
Miccioli, A. R., and D. Pollack, f.m. receiver design, 244
Michael, F. R., valve failures in ENIAC, 601
Michalowicz, J.C., 10.7-Mc/s i.f. transformers, 1284
Michel, J. G. L., with others, tropospheric refraction, 2044
Michell, R. B., radio aids to marine navigation, 2247
Middleton, D., noise through nonlinear devices, 3238
Middleton, E. J., with B. J. Stevens, a.m. *vs* f.m. for broadcasting, 261
Miedema, H., resonant circuit with nonlinear self-inductance, 368
Mignosi, D., feedback amplifiers, 1326
Migulin, V. V., and T. N. Yastrebtsova, transitron relaxation oscillators, 3064
—— with D. M. Levitas, operation of blocking oscillator, 1880
Mikheev, M. N., with P. N. Zhukova, magnetic properties of Cr-Ni-Mo steel after heat treatments, 1975
Milazzo, S., with W. Sichak, aerials for circular polarization, 3343; circularly and elliptically polarized aerials, (A) 342
Miles, J. W., diffraction of sound by infinite set of plates, 3295; equivalent circuit of bend in waveguide, 648; plane discontinuities in coaxial lines, 1249; reciprocity theorem in electromechanical systems, 969
Millar, N. P., with R. M. Rowell, long-scale instruments, 3173
Millen, J., 2-m, 6-m and 10-m transmitter, 587
Miller, C. F., and W. McLean, secondary-emission trigger valve NUTR-1032 J, (A) 2663
Miller, C. W., M. C. Crowley-Milling and G. Saxon, waveguide attenuators, 1892
—— with G. Saxon, hybrid waveguide junctions, 2163
——with others, cm-λ and dm-λ power measurement, 2022
Miller, D. A., variable-frequency h.f. transmitter, 2399
Miller, G. A., perception of short bursts of noise, 2137
—— and W. G. Taylor, perception of repeated bursts of noise, 2138
—— with others, measuring speech spectra, 924
Miller, G. H., with others, magnetic amplifiers, 864
Miller, H. F., and R. J. Hopkins, new kraft capacitor paper, 1384
Miller, L., coil-pack modification, 1331
Miller, R. L., masking effect of periodically pulsed tones, 927
—— with R. C. Mathes, phase effects in monaural perception, 925
Miller, R. W., airborne radar for meteorology, 1045
Miller, S. E., with A. L. Hopper, design of radar i.f. amplifier, 690
Miller, T., 10-cm power measuring equipment, (A) 2552
Miller, W. E., Olympia radio exhibition, 524
Miller, W. W., with S. C. Brown, CO$_2$-filled G-M counters, 783
Millington, G., Fourier transform of incomplete Gaussian function, 2833
Millman, P. M., D. W. R. McKinley and M. S. Burland, observations of 1947 Perseid meteor shower, 2511
Mills, P. J., Parmly sound laboratory and anechoic chamber, 1231
Milner, C. J., and R. B. Clayton, resistance comparison at 3300 Mc/s, 1999
—— with others, pinhole radiography of magnetrons, 2670; v.m. valves, 896
Minorsky, N., introduction to nonlinear mechanics, 156
Minter, J., performance tests for f.m. receivers, (A) 1419

Mitchell, A.R., combined signal tracer and meter, **1099**
Mitchell, C. J., heterodyning and modulation, **235**; loudspeaker damping, **(D) 13**
Mittell, B. E. G., disk recording, **(A) 1245**
Model, Z. I., and others, efficiency of valve oscillator, **1609**
Moffatt, J., diode noise generator, **1693**
Mohr, C. B. O., with J. W. F. Juritz, cosmic-ray bursts and showers, **416**
Moir, J., optimum frequency range for speech and music, **2696**
Mol, H., theory of hearing and musical pitch, **322**
Moldaver, T. I., Se rectifiers, **1379**
Moles, A., noise, methods for study of, **3005**, physiology of, **3301**
Moline, J., pulse circuits, **3057**; pulse modulation, **1497**; stabilization of supply voltages, **564**
Moll, P., carrier and pilot current equipment, **1153**
Molloy, C. T., directivity index for acoustic radiators, **3289**
Monk, N., and S. B. Wright, public telephone service on trains, **(A) 2614**
Monroe, R. B., and C. A. Palmquist, C.B.S. studio-control console, **(A) 2430, 3241**
—— with H. A. Chinn, broadcasting studio sound reinforcement, **1540**
Montague, B. W. St. L., conversion of R.1147B for 50–250 Mc/s, **3227**
Montalenti, G., sensitivity of impedance bridges, **2010**
Montgomery, C. G. (Ed.), Techniques of Microwave Measurements, **(B) [illegible]**
Montgomery, R. B., over-water refraction of 10-cm waves, **1134**
Moody, N. F., with F. C. Williams, ranging circuits and linear timebase generators, **985**
Moore, J. H., P. K. Seyler and S. B. Wright, rural R/T in Colorado, **2629**
Moran, R. B., Jr, spiral-sweep c.r.o. timer, **764**
Moreno, T., Microwave Transmission Design Data, **(B) 3545**
Morgan, A. R., with others, underwater sound transducers, **1542**
Morgan, K. Z., health problems in atomic energy, **(A) 2677**
Morgenstern, R. V., with others, concentrated-arc lamp for light-beam communication, **585**
Morgulis, N. D., emission from semiconducting cathodes, **1823**
—— P. G. Borzyak and B. I. Dyatlovitskaya, Sb-Cs cathodes, **3550**
Moroz, E. M., with S. D. Gvozdover, oscillations in magnetron with Lecher system, **1516**
Morrical, K. C., design and use of mixing networks, **1338**
Morris, C. M., and H. J. Prager, receiving valves for industrial use, **(A) [illegible]**
Morris, J., escalator process for damped Lagrangian frequency equations, **3162**
Morrison, J. F., and E. L. Younker, measurement of h.f. power and impedance, **2012**
Morrison, L. W., Jr, radar receivers, **1142**
Morrow, C. T., small enclosures and the human voice, **3315**
Morse, P. W., and H. E. Revercomb, u.h.f. heating of frozen food, **504**
Mortiaux, F., speech-input equipment of Brussels Broadcasting House, **2923**
Moseley, F. L., and others, aircraft instrumentation and control, **(A) 2524**
Moskowitz, S., and D. D. Grieg, noise suppression characteristics of pulse-time modulation, **(A) 531, 2607**
—— with others, cyclophon beam-switching tube, **883**
Moss, H., with others, c.r. tubes for radar, **(D) 887**
Moss, S. H., and G. H. Parks, pulse communication on lines, **2615**
—— with G. H. Parks, wide-band p.m., **2621**
Moss, T. S., spectral sensitivity of PbTe layers, **3132**
—— and R. P. Chasmar, spectral response of PbSe, **2662**
Mott, N. F., formation of oxide films on metals, **439**
Motto, V. E., 10-m and 20-m rotary arrays, **1277**
Motz, H., analysis of klystron reflector performance, **3567**
Moubis, J. H. A., with F. M. Penning, Ne glow discharge with Mo cathode, **2770**
Moulton, H. R., plastics as optical materials, **3156**
Mourmant, P., graphical circuit calculations, **972**; matching ranges of transmitters, **595, (C) 2097**; measurement of aerial impedance, **[illegible]**
Mouzon, J. C., grounded-grid feedback oscillator, **2484**
Mowry, S. C., with A. W. Nolle, ultrasonic propagation in high polymers, **3442**
Moxon, L. A., noise characteristics in radar receivers, **816**
—— and others, automatic control in radar receivers, **808**
Moyer, R. C., D. R. Andrews and H. E. Roys, calibration of frequency records, **(A) 2430**
Mueller, G. E., polyrods, **2449**
—— and W. A. Tyrrell, polyrod aerials, **952**
Muller, F. A., with H. den Hartog, c.r.o. timebase circuit, **685**
Müller-Strobel, J., and J. Patry, current calculation for frame receiving aerials, **33**
Mullett, L. B., with others, travelling-wave linear accelerator for electrons, **506**
Mulligan, J. H., Jr, and L. Mautner, analysis of feedback video amplifier, **2766**
Mullin, L. R., Marconi communication receiver Type RG44, **3228**
Mumford, A. H., long-distance point-to-point communication, **2077**; radio *vs* line for communication systems, **(AD) 817**
Murphy, J. L., with J. N. Van Scoyoc, electronically controlled reactance, **(A) 2475**
Murray, A. F., printed circuit applications, **1614**
Murray, F. J., Theory of Mathematical Machines, **(B) 1074**
Murray, J. M., conversion of transmitter 150-B for 14 Mc/s, **589**
Musson-Genon, R., electrolyte tank for space-charge effect in valves, **3179**; u.h.f. measurement of frequency and of *Q*, **1680**
—— with G. Goudet, electron trajectories and space charge effects, **1811**
Mustel, Z. R., corpuscular discharge from sun, **1027**
Mutter, W. E., rectification characteristics of oxide-cathode interface, **(A) 314**
Mynall, D. J., electrical analogue computing, **157, 459**; pulsed crystal-oscillator circuit, **973**

N

Nagy, E., with G. Szigeti, conductivity and fluorescence of $ZnSiO_3$, **1051**
—— with others, activation of fluorescence by Mn ions, **1875**
Najork, J., a.m./f.m. signal generator, **2297**
Nakasone, R. P., with P. Semm, r.f. oscillator-controlled potentiometer recorder, **1422**
Narcus, H., plating plastics, **2544**
National Bureau of Standards, mathematical tables, various, **(B) 162**
Nature, electrical properties of soil and water at cm λ, **2546**; French scientific library in London, **1215**; international radio conferences, **3287**; Italian cosmic-ray laboratory, **2233**; powder metallurgy abstracts, **2545**; publication and classification of scientific knowledge, **1214**; ultrasonic absorption in liquids, **1532**
Neal, L. P., and H. B. Wells, Varif receiver for λ 2 m, **1470**
Neddermeyer, S. H., and others, measurement of ultra-short time intervals with chronotron, **762**
Needham, W., with others, SiC nonlinear resistors, **(D) 3361**
Neher, H. V., discharge characteristics of G-M counters, **(A) 2308**
Neilson, P. J., electromechanical a.f. oscillator, **2712**
Neiman, M. S., electron between parallel grids, **2407**
Nelson, J. H., with others, sunspots and radio weather, **3106**
Nelson, R. B., tuning of multiple-cavity magnetrons, **2417**
Nergaard, L. S., D. G. Burnside and R. P. Stone, pulse triode for 200 kW at 600 Mc/s, **2668**
Nethercot, W., ignition interference, **253, 1148**
Nethersole, H. J. H., and L. L. Brinkworth, steel-bulb Hg-arc rectifier, **2372**
Netter, F., with M. Baranger, quantum theory, second quantification, **1615**
Neumann, R., high-vacuum pumps, **1371, 2534**
Newbery, G. R., and W. E. Willshaw, feeding a linear accelerator, **3061**
Newbound, R., with F. Widnall, protective finishing of electrical equipment, **1057**
Newell, H. E., Jr, calculating field strength in interference region, **226**; coincidence counting with G-M counters, **3199**
Newsam, B., with others, precision radar, **1962**
Newstead, G., triple magneto-ionic splitting of rays by F_2 region, **2595**
Newton, H. W., geomagnetic crochet at Abinger, **2234**; geomagnetic epoch, June 1941, **2789**; sudden commencements, 1932, in Greenwich magnetic records, **2235**
Ney, G., measurement of time-constants of resistors at l.f., **166**
Nichols, A. B., single sideband amateur transmitter, **1806**
Nichols, R. H., Jr, and others, body-baffle effects on hearing aids, **1248**
—— with others, comparison tests for hearing aids, **2711**; Hearing Aids, **(B) 2714**
Nicholson, M. G., wow meter, **3467**
Nicholson, S. B., solar and magnetic data, April-Sept. 1947, **1919**
—— with O. R. Wulf, moon and recurrent geomagnetic activity, **3109**
Nicolson, P., with others, tropospheric refraction, **2044**
Nielsen, C. E., measurement of small currents, **1673**
Nielsen, H. H., and D. M. Dennison, microwave spectrum of NH_3, **1019**
Nessen, K. F., acoustic analogue of Sommerfeld's surface wave, **3287**; even-harmonic excitation of quartz bars, **3383**; field strength of λ/2 aerial, **3024, 3025**; resonators, frequency stability of, **3369**, high-*Q*, **2196**
Nigg, D. J., f.m. studio-transmitter radio link equipment, **3516**
Nijenhuis, W., and F. L. Stumpers, properties of networks, **3364**
Nims, P. T., with O. E. Bowlus, thyratron frequency changers, **2178**
Nissen, G., universal generator, **1696**
Nixon, G. M., recording studio 3A, **1238**; studio design to minimize noise, **[illegible]**
Noble, D. E., interference reduction by cavity filters, **1479**; 2-way broadcast between train and ship, **273**
Noe, J. D., with others, distributed amplification, **(A) 2475, 3375**
Noll, E. M., simple synchronizing generator, **1781**
Nolle, A. W., adjustment speed of a.v.c. systems, **3074**
—— and S. C. Mowry, ultrasonic propagation in high polymers, **3442**
Norgaard, D. E., single-sideband transmission, **(A) 2614, 3271**
Norris, R. H., Television To-day, **(B) 1195**
Norton, F. R., television receiver laboratory, **2279**
Norton, K. A., sunspots and m.u.f. forecasts, **1447**
—— and A. C. Omberg, maximum range of radar set, **(D) 432**
Norton, L. E., with W. D. Hershberger, frequency stabilization with microwave spectral lines, **(A) 2475, 2953**
Norton, R. L., B. O. Ballou and R. H. Chamberlin, KSBR 50-kW 100.5-Mc/s f.m. transmitter, **592**
Novosil'tsev, N. S., and A. L. Khodakov, dielectric properties of $BaTiO_3$ at h.f., **1660**
Nowacki, P. J., with J. H. McGuire, common-wave duplex pulse-communication system, **2635**
Nowotny, W., p.m. methods: cyclophon, **1498**; radar in peace, **1367**
Nuovo, M., electromechanical analogies, **1865**
Nyborg, W. L., and H. K. Schilling, h.f. whistles: edge tones and resonance, **(A) 2125**
Nylund, H. W., rural R/T system, **2630**

O

Oakes, W. G., electric strength of polythene, **2267**
Oatley, C. W., u.h.f. measurements, **1988**
—— and C. M. Burrell, u.h.f. filters, **1612**
O'Brien, B. C., and F. L. Sherwood, phase monitor for broadcast arrays, **1092**
O'Brien, J. C., combined f.m./a.m. communication system, **(A) 2614**
O'Brien, W. J., radio navigation aids: decca, **113**
O'Connor, D. T., applications of Van de Graaff X-ray generator, **1115**
Oddie, T. H., and J. L. Salpeter, design of minimum-cost chokes, **2183**
Odell, L. F., standard terms and abbreviations, **2428**
Odessey, P. H., with A. Easton, counter circuits for television synchronization, **2472**
Okress, E. C., vane-type magnetron, **2671**
Ol, A. I., night sky light and solar radiation, **1643**
Ol'derogge, E. B., with L. N. Loshakov, theory of coaxial spiral line, **2715**
Oliphant, M. L., J. S. Gooden and G. S. Hide, 1000 MeV proton synchrotron, **208**
Oliver, B. M., a.v.c. as a feedback problem, **2501**
Oliver, W., long range using 1 W at 7 Mc/s, **1452**
Olsen, R. K., with G. E. Hamilton, WTTG television aerials, **653**
Olson, H. F., a.f. noise-suppression circuits, **933, (A) 2146**; Elements of Acoustical Engineering, **(B) 1548**; frequency-range preference for speech and music, **10**
—— and others, underwater sound transducers, **1542**
Omberg, A. C., with K. A. Norton, maximum range of radar set, **(D) 432**
Oosterkamp, W. J., with others, electron microscope for 400 kV, **2039**
Oppenheimer, F., with others, field control in linear accelerator cavity, **(A) 2319**
Ordung, P. F., c.r.o. measurement of short d.c. pulses, **2555**
Orthuber, R., potential distribution on metal or semiconductor surfaces, **3386**
Ortusi, J. A., barrier-layer photocells, **1202**
—— with H. Gutton, u.h.f. modulation in waveguides, **54**
Osborne, S. P., with R. D. Dunn, ploughing by radio, **1131**
Osmond, W. P., with others, magnetic properties of fine wire, **1083**
Ostlund, E. M., and H. R. Hunkins, multichannel radio-wire links, **(A) 2614**
—— A. R. Vallarino and M. Silver, stabilized f.m. system, **860**
Oswald, J., losses in waveguides, **949**; Lecher lines and related problems, **338**
Ovenden, M. W., recent developments in astronomy, **2227**
Owen, A. R. G., and L. G. Reynolds, effect of flanges on radiation patterns of small horns, **2468**
Owen, D. L., with others, common aerial working for v.h.f. systems, **3520**
Owen, F. C., with others, fading machine, **2299**
Oxford, A. J., pulse communication, **2079, (D) 2618**
—— with others, precision radar, **1962**
Oyston, H. J., with S. A. Lott, [illegible] c.r.o., **2565**

P

Packard, K. S., with others, v.h.f. s.w.r. plotting device, **(A) 2552**
Page, H., radiation resistance of ring aerials, **1862**; series-loaded mast radiators, **3342**
Paine, H. G., with H. E. Dinger, accuracy of radio noise meters, **(D) 1484**; impedance-matching λ/2 transformer, **3042**
Palieri, L., and A. Piccinini, aerial power meters, **2021**
Palluel, P., secondary electron emission from solids, **89**
Palmer, R. C., phase synchronization for remote television signals, **3260**
—— and L. Mautner, video amplifier transient response, **(A) 2475**
Palmer, W. McK., with others, measurement of rainfall by radar, **3121**
Palmquist, C. A., with R. B. Monroe, C.B.S. studio-control console, **(A) 2430, 3241**
Pande, A., survey of ionosphere theory, **723**
Pannett, W. E., characteristics of power supplies for transmitters, **281**
Panofsky, W. K. H., C. Richman and F. Oppenheimer, field control in linear accelerator cavity, **(A) 2319**
Panter, P. F., with others, distortion in pulse-code modulation, **(A) 2281**; signal/noise ratio in pulse-count modulation system, **(A) 2614**
Panton, R., G. W. Edwards and G. B. Townsend, television receiver design, **1187**
Papas, C. H., and R. King, radiation resistance of end-fire and collinear arrays, **3030**
Papp, G., with Z. Bay, coincidence circuit with high resolving power, **2471**
Pappenfus, E. W., with G. L. Sansbury, wow meter, **2148**
Parenti, V., electronic flaw-detectors, **1426**
Parker, E., cathode follower, **1593**
Parker, L. W., television intercarrier sound system, **1188**
Parkins, W. E., and J. M. Leffler, plasma sheaths as variable capacitors, **(A) 2326**
Parkinson, W. C., M. Grover and H. R. Crane, design of synchrotron magnets, **1121**
Parks, G. H., and S. H. Moss, wide band p.m., **2621**
—— with S. H. Moss, pulse communication on lines, **2615**
Parks, G. W., with others, v.h.f. cross-channel communication, **3497**
Parmentier, M., J. L. Hurault and E. Boucherot, 12-channel carrier-current system, **1489**
Parodi, M., propagation along non-uniform cable, **1549**
Parratt, L. G., with others, airborne magnetometers, **229**
Parsons, D. R., a.m. *vs* f.m., **(D) 1752**
Parsons, J. H., electronic counting and sorting devices, **(A) 2674**
Parsons, S. J., with others, effect of solar activity on D-layer ionization, **413**; galactic r.f. radiation at 64 Mc/s, **1926**; radio observations of Giacobinid meteor shower, 1946, **2781**; reflection and refraction of cm waves over ground, **519**
Partington, J. R., G. V. Planer and I. I. Boswell, dielectric residual effects in titanates, **2263**
Parzen, B., impedance measurement, **(A) 2552**
Parzen, P., electrical constants of coaxial cables, **331**
Pask, J. A., glass/metal sealing, **1972**
Päsler, M., trapezoidal waveform with minimal noise factor, **2470**
Patchett, G. N., loudspeaker damping, **(D) 13**
Pateman, J. N., with F. R. W. Strafford, television aerials, close spaced arrays, **(D) 29**
Paterson, C. C., G.E.C. research laboratories, **1524**; trends in radio communication, **2115**
Patry, J., radiation impedance of c.m. dipole, **(A) 1280**
—— with J. Muller-Strobel, current calculation for frame receiving aerials, **33**
Patterson, C. A., Jr, utility a.f. amplifier, **2208**
Patton, W. V., conductor paints, **(A) 1614**
Pawsey, J. L., with others, r.f. solar radiation and sunspots, **412**
Payne, J. J., cleaning switch contacts, **1387**
Payne-Scott, R., visibility of small echoes on p.p.i., **1965**
—— D. E. Yabsley and J. G. Bolton, solar radiation, v.h.f., **711**
—— with others, r.f. solar radiation and sunspots, **412**
Peachey, F. A., with A. R. A. Rendall, variable a.f. oscillator, **1414**
Peake, H. J., voltage amplification formulae, **2495**
Pearce, A. F., and B. J. Mayo, v.m. reflex valve for λ 10 cm, **897**
Pearce, S. F., interference, from electrified railway, **1744**, in ships, **2900**
Pearce, W. F., Introduction to Wireless, **(B) 2681**
Pearcey, T., e.m. field near cusp of caustic, **225**
Pearson, G. L., magnetic-field-strength meter using Hall effect in Ge, **3172**; physics of semiconductors, **(A) 128, 2264**
—— with W. Shockley, effect of surface charges on thin semiconductor films, **3493**
Peilin, Luo See Luo, Peilin.
Pekar, S. I., and O. F. Tomasevich, thermionic emission from metals covered by semiconductor, **3391**
Pekeris, C. L., field of dipole near horizon, **224, 1443**
Pelaez, C., Angola radio network, **2628**
Péligat, N., electronic multi-range voltohmmeter, **1100**
Pendleton, W. W., correction of corona on small bushings, **(A) 145**
Penin, F., aerial navigation systems, **1961**
Penning, F. M., and J. H. A. Moubis, Ne glow discharge with Mo cathode, **2770**
Penrose, R. P., with B. Bleaney, inversion spectrum of NH_3, pressure broadening, **1916**, collision broadening, **3397**
Pepinsky, R., and P. Jarmotz, h.v. stabilizer, d.c., **3257**, inductively coupled degenerative, **(A) 278**
—— and others, recovery time of G-M counters, **2309**
Pepper, T. P., omnidirectional array of stacked V-aerials, **2170**
Pera, R., all-band amateur transmitter, **1803**
Perlat, A., meteorology and radio, **2236**
Perrier, F., a.c. Wheatstone bridges, **3180**
Perronne, G., h.f. case-hardening of steel, **1117**
Person, R. P., and T. A. Rich, opinion meter, **1118**
Person, S. V., distortion correction in class-B modulator, **1809**
—— with others, efficiency of valve oscillator, **1609**
Persoz, B., uniform and exponential transmission lines, **1258**
Peskin, E., and E. Weber, d.c. characteristics of microwave bolometers, **[illegible]**
Peters, B., with others, f.m. cyclotron, **2314**
Peters, P. H., magnetron f.m. method, **(A) 2614**
Peters, R. G., aerial tower design, **35**; facsimile transmitter, **2648**; h.f. f.m. amplifier, **691**
Peterson, D. W., with others, v.h.f. television propagation measurements, **3224**
Peterson, E., with L. A. Meacham, multichannel pulse-code modulation system, **2366**
Peterson, G. E., with others, Hearing Aids, **(B) 2714**; hearing aids, body-baffle effects on, **1248**, comparison tests for, **2711**
Peterson, H. A., with others, electron trajectories by differential analyser, **2408**
Peterson, J., United Nations telecommunications, **557**
Peterson, L. C., space-charge effects in microwave tetrodes, **880**
Petraglia, P. A., (Ed.), Electronic Engineering Master Index, 1946, **(B) 1220**
Petrich, R. O., wide-band 550-Mc/s amplifier, **692**
Petrides, T., diode crystals for variable time constants, **371**
Petrie, D. P. R., principles of v.m., **893**
Petrie, D. R., with others, v.m. valves, **895**
Petrie, W., excitation conditions in upper atmosphere, **1359**
Petropoulos, G. M., h.v. characteristics of earth resistances, **1962**
Petrzilka, V., and J. Beneš, crystal sets determined by X rays, **144**
Pfeil, K., tracking in superheterodynes, **3502**
Phélizon, G., with A. Clavier, Paris-Montmorency f.m. radio link, **551**
Philipps, E. M., microphones, characteristics of, **1239**
Phillips, E. N., W. G. Sterns and N. J. Gamara, High Frequency Measuring Techniques using Transmission Lines, **(B) 2030**
Phillips, H. B., and L. A. Ware, transit-time effect in klystron gaps, **896**
Phillips, J. W., with others, effect of solar activity on D-layer ionization, **413**; galactic r.f. radiation at 64 Mc/s, **1926**
Phillips, M. L., critical frequencies and solar activity, **727**
Piaggio, H. T. H., magnetic field of massive rotating body, **2775**
Piatti, L., u.h.f. receiving valves, **2413**
Piaux, L., recent researches on insulating materials, **2819**
Picard, M., antivibration immersion galvanometer, **2846**
Piccinini, A., with L. Palieri, aerial power meters, **2021**
Pickard, G. W., and H. T. Stetson, tropospheric propagation and weather, **1453**
Pickering, N. C., high-fidelity volume expander, **696**; record wear, **2694**; space-charge output tetrodes, **(A) 868, 2667**
Pidd, R. W., with L. Madansky, parallel-plate counters, **3206**
Piddington, J. H., and L. C. Hibbard, timebase for radar range measurement, **[illegible]**
Pierce, J. A., solar eclipse of 1st Oct. 1940, **1924**
Pierce, J. R., noise in resistors and valves, **2220**; passive modes in travelling-wave valves, **3548**
—— and W. G. Shepherd, reflex oscillators, **611**
Pillow, M. E., with A. E. Bate, mean free path of sound in auditorium, **2**
Pim, J. A., u.h.f. breakdown strength of air, **3141**
Pinciroli, A., negative-resistance crystal oscillators, **1882**; standard-frequency and time signal centre, Turin, **1987**
Pine, C. C., r.f. shielded room, **2642**
Pinkerton, J. M. M., ultrasonic absorption in water, **4**
Pipes, L. A., Applied Mathematics for Engineers and Physicists, **(B) 1394**
Pippard, A. B., medium aperture horn radiators, **2453**; surface h.f. impedance of superconductors, **1014**
—— and N. Elson, elimination of standing waves in paraboloid waveguide-fed lenses, **2489**
—— G. E. H. Reuter and E. H. Sondheimer, conductivity of metals at microwave frequencies, **(D) 2768**
Pisarevski, A. M., with A. I. Lebedev-Karmanov, modulation system design problems, **1808**
Pistolkors, A. A., theory of circular diffraction aerial, **1858**; theory of slot aerials, **1268**
Pivovarov, S. P., high-gain a.f. amplifier, **3376**; voltage stabilization for television apparatus, **1766**
Planer, G. V., with others, dielectric residual effects in titanates, **2263**
Platt, J. R., with W. S. Huxford, infra-red communication systems, **2908**
—— with H. S. Snyder, principles of optical communication systems, **2909**
Ploos van Amstel, J. J. A., small Se rectifiers, **3253**
Pluss, E., f.m. signal interference, **815**
Poch, W. J., television synchronizing generator frequency stability, **292**
—— and H. C. Shepard, television mobile unit, **1789**
Portevin, M., X-ray tube with line focus, **217**
Porvanov, K. M., ferromagnetic materials in alternating fields, **3430**
Pollack, D., with A. R. Mitchell, f.m. receiver design, **244**
Pollack, I., atonal interval, **2136**; filtering and speech intelligibility, **[illegible]**; monaural and binaural thresholds, **1536**
—— with J. C. R. Licklider, effects of distortion on intelligibility of speech, **1537**
Pollard, C. E., with E. L. Brown, Hg-contact relays, **(A) 2374**
Polonsky, J., improvements in negative-feedback amplifiers, **3377**

Pomeroy, A. F., measurement of impedance mismatch in waveguides, **468**
Pond, T. A., and W. F. Cannon, microwave spectrum of NH_3, **1018**
le Poole, J. B., electron microscope with variable magnification, **213**
—— with M. v. Ments, computation of magnetic electron lenses, **2321**
—— with others, electron microscope for 400 kV, **2039**
Popok, S. A., and F. D. Klement, influence of infra-red rays on CaS-Pb phosphors, **1651**
Porter, R. W., ultrasonic siren, **2433**
Posin, D. Q., microwave spark, **2818**
Possenti, R., charts for attenuation in Zobel filters, **1334**
Potemkin, V. V., ladder-type filters, **3070**
Potier, G., pulse multiplex communication, **3507**
Potter, J. A., control of thyratron rectifiers, **39**, **2640**
Potter, R. K., G. A. Kopp and H. C. Green, Visible Speech, **(B) 2713**
Pound, R. V., duplex microwave communication system, **3247**; stabilization of microwave oscillators, **1311**
—— and E. Durand, Microwave Mixers, **(B) 2609**
Power, J. R., Models 65 and 66 hearing aids, **2156**
Powles, J. G., measurement of permittivity at cm λ, **2541**
—— with R. Dunsmuir, dielectric properties of liquids at λ 9.4–50 cm, **1992**
Prache, P. M., electron motion between constant-potential electrodes, **1012**; theory of negative-feedback amplifiers, **383**, **1329**
—— with M. Prudhon, extensions of network theory, **1292**
Prager, H. J., with C. M. Morris, receiving valves for industrial use, **(A) 2663**
Pratt, H. G., signal generator, **1098**
Pratt, T. H., infra-red image-converter tube, **1710**
du Pré, F. K., with M. Gevers, power factor and permittivity temperature coefficient of solid dielectrics, **1059**
Preisman, A., nodal method of circuit analysis, **(D) 671**
Prentice, J. P. M., A. C. B. Lovell and C. J. Banwell, radio echo observations of meteors, **2779**
Pressey, B. G., h.f. and v.h.f. radiogoniometers, **3414**, error measurement for, **3413**
—— and G. E. Ashwell, pulse field-strength measuring set for v.h.f., **1684**
Preston, J., with others, underwater sound transducers, **1542**
Price, J. F., effectiveness of by-pass capacitors at v.h.f., **2473**
Price, S. L., balanced clipper noise suppressor, **2692**
Price, W. L., shadow effects due to temperature inversions, **3490**
Prichard, J. S., with H. R. Skifter, aerial pattern measurement, **2727**
Primakoff, H., and J. B. Keller, reflection and transmission of sound by thin curved shells, **912**
Prins, D. G., d.c. amplifiers with automatic zero adjustment, **1602**
Pritchard, R. L., and M. D. Rosenberg, optimum directivity patterns for linear acoustic arrays, **(A) 3292**
Pritchard, W. L., $\lambda/4$-coupled waveguide filters, **1000**
Procopiu, S., geomagnetism, D and H at Jassy, 1941–1947, **1933**; secular variations of magnetic elements at Jassy, 1931–1947, **1935**
Prokhorov, A. M., with L. A. Lyusternik, determination of operator eigenvalues by RC circuit, **457**
Prowse, W. A., solid diagrams for resonance phenomena, **2481**
Prudhon, M., and P. M. Prache, extensions of network theory, **1292**
Pruzhanski, M. M., with others, tower aerials for broadcasting, **26**
Pryce, M. H. L., with C. Domb, field strength over spherical earth, **800**
Ptitsyn, S. V., emission from oxide cathodes, **1826**
Pugh, A. L., Jr, with J. Marsten, printed resistors, **(A) 1614**, **(A) 2763**
Pugliese, F., with others, u.h.f. mobile and fixed communication, **2081**, **(D) 3514**
Puleston, R., with others, c.r. tubes for radar, **(D) 887**; c.r. tube screens for radar, **885**
Pullen, K. A., Jr, cathode-coupled amplifier, **(D) 1322**
Pumper, E. J., experimental investigation of electric fluctuations, **1520**
Pumphrey, R. J., and T. Gold, degree of resonance of human ear, **8**; resonance theory of hearing, **3003**
Putley, E. H., silicon/metal contact resistance, **2537**
Putman, J. L., input impedance of centre-fed $\lambda/2$ slot aerial, **3346**
—— and W. B. Macro, slot aerials in corner reflectors, **2467**
—— B. Russell and W. Walkinshaw, field near centre-fed $\lambda/2$ slot aerial, [illegible]

Q

Quantie, Chow See Chow Quantie.
Queffelec, J., multivibrators using two triodes, **2487**
Quenouille, M. H., random flights, **(D) 699**
de Quevedo, J. L. G., with others, frequency stabilization of microwave oscillators by spectrum lines, **2180**

R

Radio Corporation of America, R.C.A. Technical Papers Index [to 1947], **(B) 1844**
Radley, W. G., hearing-aid development, **1246**; speech communication in deafness or loud noise, **2690**
Rado, J. A., with others, feedback amplifiers, **(A) 382**
Rae, E. R., with S. C. Curran, G-M counters, analysis of impulses from, **1708**, with beaded wires, **494**
Ragg, M., rust and the protection of iron, **441**
Raitt, R. W., ultrasonic reflection from sea bottom, **(A) 629**
—— with others, reverberation in the sea, **3290**
Rakshit, H., molecular and atomic oxygen in upper atmosphere, **418**
Ralston, D. D., transmitter for local duplex operation, **307**
Rambo, W. R., coaxial load for u.h.f. calorimeter wattmeters, **174**
Ramer, L. G., with P. E. Sabine, absorption/frequency characteristics of plywood panels, **2691**
Ramm, C. A., photoelectric thresholds of G-M counters, **1707**
Ramsay, B. P., with V. A. Brown, Maxwell bridge at periods 1–200 sec, **(A) 132**
Ramsay, H. T., rating of thermionic rectifiers, **599**
Ramsay, J. A., vertical distribution of radar field strength over sea, **2058**
Ramsay, J. F., Fourier transforms in aerial theory, **155**, **1068**, **2270**, **3159**
Ramsden, W., with others, efficiency of ZnS phosphors, **3422**
Rand, G. E., duocone loudspeakers, **1240**
Randall, J. A., with others, resistivity and Hall effect of Ge at low temperatures, **(A) 139**
Randall, J. T., with H. A. H. Boot, cavity magnetron development, **890**, **(D) 3564**
Ranger, R. H., magnetic-tape recorders, **329**, design of, **20**
Rantzen, H. B., A. R. A. Rendall and S. N. Watson, land-line technique for television outside broadcasts, **3536**
Rassweiler, G. M., with W. S. Erwin, ultrasonic resonance and non-destructive testing, **1112**
Ratcliffe, J. A., and I. J. Shaw, interaction of radio waves, **3219**
Ratheiser, L., cathode problems, **1824**; international frequency-changer equivalents, **1821**; oscillation frequency limits of grid-controlled valves, **1819**; receiver design, **1459**; u.h.f. circuits, **1288**; wide-band amplification, **2753**
Rathenau, G. W., and J. L. Snoek, magnetic anisotropy in Ni-Fe alloys, **3428**
Rathgeber, H. D., with D. J. Medley, precision double-pulse generator, **3191**
Ratsey, O. L., radar transmitters, survey of developments, **2095**
Rau, R. R., with others, mass and disintegration products of meson, **715**
Rauch, L. L., fluctuation noise in pulse-height multiplex radio links, **815**
Rawer, K., calculation of field of space wave, **514**; forecasting of ionosphere critical frequencies, **419**; ionospheric perturbations in zone of polar auroras, **421**
—— with L. Hamberger, s.w. propagation round earth, **3216**
Ray, J., with others, inherent noise in receivers, **2349**
Raymond, —, with — Giloteau, television reception tests, **1798**
Rayner, G. H., and L. H. Ford, capacitance measurement at National Physical Laboratory, **2863**
Read, G. W., and R. R. Scoville, intermodulation-distortion meter, **2858**
Read, J. C., h.v. Hg-arc rectifiers, **(D) 561**
Read, O., recording and reproduction of sound, **1545**, **2441**, **2706**
Reber, G., solar intensities at 480 Mc/s, **1921**
Redgment, P. G., with R. V. Whelpton, c.w. long-range navigation aids, **1958**
Redmayne, W., transmission-line theory simplified, **3013**
Redston, G. D., and J. E. Stanworth, effect of temperature and/or humidity on seal stresses, **2799**
Reed, R., electron microscopy conference, Leeds, 1947, **1713**
Regenstreif, E., electron mirrors, **1013**
Reich, H. J., mode separation in oscillators, **(A) 2475**
—— and R. L. Ungvary, a.f. and ultrasonic frequency meter, **2292**
Reid, A. F., internal cyclotron targets, **795**
Reid, D. G., 60-cm multichannel pulse-phase-modulation system, **2625**
—— and J. K. Garlick, absorption wavemeter for dm λ, **3464**; cm-λ beam telephone, **3506**
Reid, J. M., with S. C. Curran, nonsymmetrical counters, **2577**
Reitz, L. P., reverberation tests in broadcast studios, **930**
Relton, F. E., Applied Bessel Functions, **(B) 2275**
Remillon, R., with others, aberration of e.s. lens, **2040**
Rendall, A. R. A., and F. A. Peachey, variable a.f. oscillator, **1414**
—— with others, land-line technique for television outside broadcasts, **3536**
Renwick, W., with M. V. Wilkes, ultrasonic memory unit for EDSAC, **3448**
Retief, D. P. J., and H. J. Barker, SOJ-12 open-wire carrier telephone systems, **2610**
Rettie, R. S., with others, 16-MeV betatron, **3482**
Rettinger, M., dynamic symmetry of studios, **636**
—— and S. M. Stevens, sound reinforcement in the Hollywood Bowl, **1544**
Reuter, G. E. H., with others, conductivity of metals at microwave frequencies, **(D) 2768**
Revercomb, H. E., with P. W. Morse, u.h.f. heating of frozen food, **504**
Revirieux, P., localization of sporadic-E regions, **3410**
Rex, H. B., magnetic amplifier, **1869**
Reynolds, G. D., component testing for receivers, **2864**
Reynolds, L. G., with A. R. G. Owen, effect of flanges on radiation patterns of small horns, **2468**
Reynolds, S. I., re-entrant cavity for loss measurement, **765**
Rhodes, D. R., miniature 10-m R/T transmitter, **1508**
Rhodes, R. G., with H. F. Kay, $BaTiO_3$ crystals, **126**
Riblet, H. J., maximum directivity of aerials, **2731**; theory of directional couplers, **675**; impedance indicator for λ 3 cm, **(A) 2552**
—— and T. S. Saad, waveguide directional coupler, **1855**
Rice, S. O., matrix theory for reflections from circular bends in rectangular waveguides, **2721**; properties of sine wave plus noise, **2219**
Rich, T. A., and G. F. Gardner, self-balancing potentiometer, **768**
—— with R. P. Person, opinion meter, **1118**
Richards, P. I., resistor-transmission-line circuits, **1871**; scalar and vector potentials, **702**
Richardson, A. W., with B. J. Cosman, Harvey double superheterodyne f.m. receiver, **246**
Richardson, H. O. W., magnetic focusing between inclined plane pole-faces, **409**
Richardson, J. R., and others, f.m. cyclotron, **2314**
Richman, C., with others, field control in linear accelerator cavity, **(A) 2319**
Richman, P. L., with others, packaged amplifiers, **2207**
Richmond, A. E., a.f. response measurements in broadcasting, **1406**
Richmond, I. J., with others, u.h.f. mobile and fixed communication, **2081**, **(D) 3514**
Ridenour, L. N. (Ed.), Radar System Engineering, **(B) 435**
Rideout, V. C., a.f.c. of microwave oscillators, **276**; parallel-tuned transformer design, **2177**
Rider, J. F., and S. D. Uslan, F.M. Transmission and Reception, **(B) 3526**
Ridgway, J. F., with D. G. Tucker, design of synchrodyne receiver, **526**
Riese, G., with W. Kleinsteuber, selectivity of broadcast receivers, **3499**
Riethmüller, J., methods and apparatus for measuring emission of oxide cathodes, **1095**
Rigal, R., propagation in cylindrical waveguides, **2723**
—— and J. Voge, waveguide theory for plane waves, **1553**
Rigterink, M. D., and R. O. Grisdale, porcelains with low dielectric loss, **(A) 445**
Rimes, R. E., earthing and soil resistance, **1063**
Ring, D. H., delay distortion in microwave repeaters, **2859**
—— with A. C. Beck, testing with circulated pulses, **777**
Rinia, H., J. de Gier and P. M. van Alphen, home projection television, **2387**
—— with H. de Brey, air cooling of transmitting valves, **2673**
Risch, R., a.c. auxiliary magnetization of cores, **2507**
Ritson, D. M., J. B. Hasted and C. H. Collie, dielectric properties of water, heavy water and solutions at h.f., **79**
—— with others, dielectric properties, of polar liquids at cm λ, **1991**, of water and heavy water, **2508**
Ritson, F. J. U., with others, strobes and recurrence-frequency selectors, **987**
Rittner, E. S., improvement of photocell characteristics, **1816**; semiconductors as amplifiers, **3065**
Rivault, R., atmospherics, fine structure of, **2519**, origin of, **2521**
Rivère, P., multiplex R/T link for Corsica, **3508**
Rizkin, A. A., free regime of linear systems, **3046**; self-balancing phase inverters, **(D) 2192**
Roach, R. G., with C. N. Smyth, dielectric measurements at cm λ, **1994**
Roaf, D., with others, signal generators for cm-λ noise-factor measurements, **2026**
Robbins, R. C., and F. W. Black, crystal rectifiers for measurements, **1770**
Roberts, A. (Ed.), Radar Beacons, **(B) 3418**
Roberts, F. F., pulse technique in cable fault location, **2842**
Roberts, R. S., with W. J. Tucker, Plastics for Electrical and Radio Engineers, **(B) 1066**
Robertshaw, R. G., with others, microwave communication link, **549**
Robertson, S. D., targets for microwave radar navigation, **1043**
Robinson, C. S., with H. W. Koch, pulse operation of betatron, **2315**
Rocard, Y., background noise due to sea waves, **251**, **1742**; French radio observations during solar eclipse, 20th May 1947, **1632**; magnetostriction of Ni, **408**; radar reception of solar e.m. radiation, **1627**; stability criteria for oscillatory systems, **1568**
Rochester, N., and D. R. Brown, rectifier networks for multi-position switching, **(A) 2475**
Rodda, S., potential distribution in beam tetrodes, **2109**; thermal noise in resistors, **(D) 2072**, **(C) 3239**
Roddam, T., high-stability LC oscillator, **3374**
Roe, J. H., television field pickup equipment, **1506**
—— and N. S. Bean, television field equipment, **2389**
Roeschke, C., transformer design, **38**
Roetken, A. A., repeaters for New York/Boston relay system, **2919**
Roger, B., the electroshock, **3201**
Rogers, D. C., cm-λ signal generators, **2027**
—— with E. H. Ullrich, measurement of receiver noise factor, **1743**
Rogers, W. E., analysis of complex waves, **3171**
Rogozinski, A., and A. Voisin, measurement of efficiency of G-M counters, **498**
Romani, L., with others, aberration of e.s. lens, **2040**
Romanow, F. F., and M. S. Hawley, rating of microphones and loudspeakers, **324**
Romanus, H., with H. Alfvén, trochotron valve, **1205**
Romell, D., frequency change during propagation, **2052**
Romeyn, F. C., with others, semiconductors with large negative temperature coefficient of resistance, **2265**
van Rooy, A. P., with J. de Gier, improvements in c.r. tube construction, **2669**
Roper, C. G., and J. F. Engelberger, electromechanical d.c. amplifier, **693**
Roques, P., frequency changing in television receivers, **1193**
de Rosa, L. A., loudness, pitch, and masking phenomena, and cochlea mechanics, **(A) 3312**; phase distortion in audio systems, **(A) 2430**
Rose, A., with P. K. Weimer, electron motion in uniform magnetic field, **709**
Rosenberg, M. D., with R. L. Pritchard, optimum directivity patterns for linear acoustic arrays, **(A) 3292**
Rosenberg, W., milliwattmeter for 8700–10000 Mc/s, **187**
Rosentreter, E. W., single-signal single-sideband adapter, **3230**
Rosovsky, M. L., propagation in viscous medium, **1016**
Ross, A. E., pulse-position modulation without fixed reference, **(A) 2614**
Ross, A. H., with H. F. Meyer, multipath transmission simulator, **(A) 2552**
Ross, A. W., problems in shipborne radar, **1971**
Ross, D. A., with others, Hearing Aids, **(B) 2714**; hearing aids, comparison tests for, **2711**
Ross, H. M., with others, modulation and waveform of light beam, **1087**
Ross, I. M., war-time development of components, **1900**
Ross, R. G., radar storm detection, **1964**
Ross, W., fundamental problems in h.f. direction finding, **1955**
—— and R. E. Burgess, design of H-type Adcock direction finders, **2528**
Rossby, C. G., angular velocity distribution in atmosphere, **1083**
Roston, B., v.h.f. screening, **2817**
Roston, —, buried metal detection, **(A) 2882**
Rotblat, J., E. A. Sayle and D. G. A. Thomas, scale-of-100 counter, **2306**
Rothenberg, H. C., with I. Rudnick, crystal probe microphone, **(A) 3327**
Roubine, E., recent theories of the aerial, **341**
Rousseau, J., with G. Giniaux, receivers at 1948 Paris fair, **3231**
Rowe, F. M., and N. P. Millar, long-scale instruments, **3173**
Rowland, H. J., aerials for Citizens Radio, **2456**; series reactance in coaxial lines, **1854**
Rowley, L., interference from aircraft electrical equipment, **2602**
Royden, G. T., radio-range and R/T equipment, **2634**
Royer, J., with R. Charbonnier, circuits and valves in electronics, **359**; video amplifiers, h.f. correction of, **1799**, l.f. correction of, **1194**
Roys, C. S., and P. H. Chin, constant-current networks, **(A) 2475**
Roys, H. E., disk recording, cutting force on lacquer blanks, **638**, intermodulation distortion analysis, **630**
—— with others, calibration of frequency records, **(A) 2430**
Rubel, J. H., with J. P. Blewett, coaxial delay lines, **1287**
Ruddlesden, R., E. Forster and Z. Jelonek, carrier frequency shift telegraphy, **2354**
Rudenberg, H. G., delay-line-coupled wide-band pulse amplifier, **(A) 2209**; theory of delay-line-coupled travelling-wave amplifier, **(A) 2475**
Rudmose, H. W., acoustic performance of rooms, **(A) 2143**
—— and others, voice measurements with audio spectrometer, **3316**
Rudnick, I., propagation of acoustic wave along boundary, **(C) 2122**
—— and H. C. Rothenberg, crystal probe microphone, **(A) 3327**
—— with C. H. Allen, high-power 3–34-kc/s siren, **917**
—— with others, biological effects of intense sound, **1533**
Ruegg, W., with E. Metzler, broadcasting on l.v. distribution networks, **2613**
Rumbaugh, L. H., with others, airborne magnetometers, **220**
Runcorn, S. K., variation of geomagnetism with depth, **2516**
Rushchuk, I. M., with others, tower aerials for broadcasting, **26**
Rushforth, L., with others, high-power pulsed magnetron, development, **892**, **(D) 3566**
Rushman, D. F., and M. A. Strivens, permittivity of porous samples of $BaTiO_3$, **2282**
Russell, B., with others, field near centre-fed $\lambda/2$ slot aerial, **3345**
Russell, O. J., modern G-M tubes, **2870**
Ruthberg, S., with others, h.f. properties of iron-alloy cores, **754**
Rybner, J., circle diagrams of impedance or admittance for quadripoles, **(A) 3357**; Nomograms of Complex Hyperbolic Functions, **(B) 1986**
Rydbeck, O. E. H., theory of travelling-wave valve, **2962**
Ryde, J. W., attenuation and scattering at cm λ due to clouds, rain, etc., **2062**
—— with others, Si-W crystal rectifiers, **687**
Ryder, J. D., Electronic Engineering Principles, **(B) 907**
Ryder, R. W., earthing problems, **2825**
Ryftin, Ya. A., resolving power of television system, **1785**
Ryle, M., solar radio emission and sunspots, **2228**
—— and D. D. Vonberg, solar radiation, r.f., **2784**, at 80 and 175 Mc/s, **96**
Rymer, T. B., electrical and acoustical instruments at Physical Society's Exhibition, 1947, **179**
Rytov, S. M., field strength measurement at cm λ, **491**; group velocity of e.m. waves, **1720**
—— and M. E. Zhabotinski, oscillations in self-oscillatory systems, **456**
Ryvkin, S. M., with B. T. Kolomiets, photoelectric properties of InS and InSe, **1388**

S

Saad, T. S., with H. J. Riblett, waveguide directional coupler, **1855**
Saars, W. F., with W. W. Stifler, Jr, sofar [sound fixing and ranging], **2797**
Sabaroff, S., distortion analysis technique, **2855**
Sabine, H. J., sound absorption and impedance of materials, **928**
Sabine, P. E., and L. G. Ramer, absorption/frequency characteristics of plywood panels, **2691**
Sacerdote, G., inductive bridge, **1289**
Sack, H. S., and others, magnetic amplifiers, **664**
Saddy, J., photoluminescence of ZnS, **1650**
Saget, J., recent progress in the production of X rays, **2876**
Saha, M. N., B. K. Banerjea and U. C. Guha, ionospheric propagation of e.m. waves, **1442**; microwave radiation from sun, **2229**
de Saint-Romain, A., modern e.m. sweep technique, **2092**
Saksena, B. D., constants of α- and β-quartz, **2538**
Salisbury, W. W., with D. H. Menzel, a.f. radio waves from the sun, **1628**
Salpeter, J. L., fluorescent light and lamps, **1390**; magnetic materials, **1662**; television and colour, **1782**
—— with T. H. Oddie, design of minimum-cost chokes, **2183**
Samarski, A. A., and A. N. Tikhonov, excitation of waveguides, **3335**
Samoilov, V. F., sawtooth-current generator, **1587**
Samuel, A. L., c.r.o. presentation of impedances, **771**
—— and C. F. Crandell, waveguide bridge to measure gain at 4000 Mc/s, **(A) 2552**
Samuelson, R. E., field tests and coverage of 465-Mc/s equipment, **1728**
Sander, K. F., galactic noise at 60 Mc/s, **2515**
Sands, M., with others, Model-200 pulse counter, **1105**
Sandström, A. E., e.m.f. and internal resistance of barrier-layer photocells, **600**; mechanism of Se photocells, **312**
Sanial, A. J., curve tracer for loudspeakers and microphones, **2439**; loudspeaker design by electromechanical analogy, **939**
Sansbury, G. L., and E. W. Pappenfus, wow meter, **2148**
Sapozhkov, M. A., summation of nonlinear distortions, **2071**
Sarna, H. R., P. L. Kapur and — Charanjit, He-filled G-M counters, **3474**
Sassoon, H., Alexandra Palace television centre, **2094**
Satche, P., theory of quadripoles in closed chains, **967**
Savery, W. R., with others, alignment signal generator with display, **1695**
Savory, W. A., design of a.f. compensation networks, **2435**
Saxon, D. S., with others, propagation in 2-dielectric coaxial lines, **(A) 2166**
Saxon, G., and C. W. Miller, hybrid waveguide junctions, **2163**
—— with others, cm-λ and dm-λ power measurement, **2022**; waveguide attenuators, **1892**
Saxton, J. A., determination of aerial gain from polar diagram, **1861**; dielectric properties, of aqueous salt solution, **1915**, of water at cm λ, **1913**, **1914**, of water vapour at u.h.f., **1996**
—— and A. C. Grace, cm-λ field-strength meter, **2029**
—— and J. A. Lane, dielectric properties of water at cm λ, **1912**
—— with H. R. L. Lamont, intensity-distance law of radiation, **3492**
Sayle, E. A., with others, scale-of-100 counter, **2306**
Sayre, D., with others, recovery time of G-M counters, **2309**
Scal, R. K. F., frequency-halving circuit, **55**
Scanlon, W., and K. Lark-Horovitz, electrical behaviour of Te, **(A) 130**
Schaaffs, W., d.c. bridge with nonlinear resistances, **1570**; measurement of L, C or R by phase displacement, **1670**
—— with H. Gerdien, mechano-piezoelectric generator for pulses and short time intervals, **2579**
Schade, O. H., electro-optical characteristics of television systems, **2940**, **3261**; magnetic deflection circuits for c.r. tubes, **674**
Schatz, E. R., with others, measurement of ultra short time intervals with chronotron, **762**
Schaub, C., with others, impact testing of plastics, **1065**
Schein, M., with others, cosmic rays, latitude effect, **714**
Schelkunoff, S. A., with M. C. Gray, approximate solution of differential equations, **2835**
Scherb, M. V., photoelectric effect in self quenching G-M counters, **2033**
—— with C. E. Mandeville, resolving time and coincidence loss for G-M counters, **2034**
Scherer, W. M., cathode-follower v.f.o., **375**; converted ART/13 speech amplifier, **1319**; television interference prevention, **3538**
Scherrer, P., with others, dielectric properties of Rochelle-type crystals, **438**
Schick, W., capacitance stability of mica, **447**
Schiffermuller, R., permeability of ring dust-cores, **471**
Schifrine, J., direct reading impedance meter, **2851**
Schilling, H. K., with W. L. Nyborg, h.f. whistles, edge tones and resonance, **(A) 2129**
Schlegel, R. A., f.m. calibrator, **773**, applications, **774**
Schlesinger, K., l.f. compensation for amplifiers, **1601**; magnetic deflection in kinescopes, **573**
Schneeberger, R. J., tetrode voltmeter for high negative voltages, **2235**
Schneider, A. W., public address systems for United Nations auditoria, **15**
Schneider, E. E., with others, transmission line diode as cm-λ noise source, **2073**
Schoch, A., with others, sound absorber and sound damped room, **8**
Schonland, B. F. J., and P. G. Gane, lightning warning device, **(D) 2783**
—— with P. G. Gane, ceraunometer, **2784**
—— with D. J. Malan, lightning, **1382**
Schott, F. W., with others, network analyser for study of e.m. fields, **(A) 2475**

Schott, J. T., with others, pulse-echo measurements on cables, **2295**
Schouten, J. F., perception of pitch, **1225**
—— with others, 48-channel carrier telephone system, **2356**
Schrader, H. J., with others, teleran, **1647**
Schroeder, A. C., with others, experimental simultaneous colour television system, **572**
Schuck, O. H., standard delay line for phase measurement, **1683**
Schulz, P., theory of high-current arc column, **3086**
Schulz, W. M. H., h.f. insulating materials and chemical structure, **1385**
Schumann, F., and C. Duke, r.f. bridge for broadcast stations, **2583**
Schumann, G., with R. Kollath, 15-MeV betatron, **3207**
Schupp, R. L., and R. Mecke, valve voltmeter and d.c. amplifier, **3178**
—— with R. Mecke, sensitive capacitance measurements, **2000**
Schwartz, E., f.m., **2617**
Schwartz, L. S., Rieke diagrams for oscillator design, **3371**; statistical methods in electronic system design, **(A) 2677, 2992**
Schwarzschild, M., with L. F. Hausman, integration of differential equations by use of punched-card machines, **1667**
Schwinger, J., with H. Levine, sound radiation from unflanged pipe, **(A) 628, 1845**
Scott, F. S. G., standard terms and abbreviations, **(D) 2676**
Scott, H. H., dynamic a.f. noise suppressor, **932**
—— and E. G. Dyett, Jr, audio amplifier and noise suppressor, **2759**
Scott, R. F., Collins receiver, Model 75A-1, **2599**
Scott, W. E., mean K-indices and C-values for 1946, **1929**
Scott, W. J., power supplies for aircraft communication equipment, **2646**
—— with others, v.m. valves, **895**
Scoville, R. R., with G. W. Read, intermodulation-distortion meter, **2858**
Scroggie, M. G., advantages of large receiving aerial, **28**; a.m. *vs* f.m., **(D) 1160**; heterodyning and modulation, **(D) 1145**; sound reproduction, **(D) 1224**; standard terms and abbreviations, **2427**
Seal, P. M., square-wave analysis of compensated amplifiers, **(A) 2552**
Seaman, E. C. H., panoramic receiver, 3.5–20 Mc/s, **2600**
Sears, R. W., electron-beam tube for pulse-code modulation, **2411**
Seaton, S. L., electron production in ionosphere, **724**; experimental determination of ionospheric gyrofrequency, **2238**; magneto-ionic multiple refraction at high latitudes, **2594**
—— and C. W. Malich, Auroral Research at College, Alaska, **(B) 2795**
—— H. W. Wells and L. V. Berkner, Ionospheric Research at College, Alaska, **(B) 2796**
Seaver, J. D., and R. E. Anderson, quality control of permanent-magnet alloys, **449**
Secker, B., accuracy of impedance measurements, **3170**
Seeley, S. W., ratio detectors for f.m. receivers, **2346**
Seely, S., microwave aerial analysis, **656**
Selényi, P., space-charge theory and electron inertia, **3393**
—— and N. Székely, effect of bending on Se rectifiers, **86**
Seleznyova, E. S., diurnal variation of tropospheric temperature, **109**
Seligmann, P., with others, ionosphere and solar eclipse, 20th May 1947, **1640**
Sells, G. B., v.h.f. crystal oscillators, **1301**
Semenov, V. F., lattice filters for dm λ, **287**
Semm, P., and R. P. Nakasone, r.f. oscillator-controlled potentiometer recorder, **1422**
Sequeille, G., components salon, Paris, **1897**
Serber, R., beam dynamics in linear accelerator, **(A) 2317**
Serem, L., decade-ring scaling circuit, **2184**
Serin, B., conductivity of metals at u.h.f., **1345**
Sette, D., distortion in light modulation by ultrasonic cell, **3000**
—— with P. G. Bordoni, capacitance meter with quartz resonance indicator, **(A) 2289**
Sev, A., with M. Toussaint, synchronization of broadcasting networks, **260**
Severin, H., diffraction at aperture in metal sheet, **3097**
Sevin, P., distortion due to nonmetallic resistors, **3362**
Sewig, R., comparison of neighbouring frequencies by beats, **3463**
Seybold, M., curing interference to television reception, **254**
Seyler, P. K., with others, rural radiotelephony in Colorado, **2629**
Seymour, R. A., with W. H. B. Cooper, temperature-dependent resistors, **666**
Shadowitz, A., shunted-amplifier input admittance, **2758**
Shamos, M. H., and I. Hudes, design of metal G-M counters, **1102**
Shankland, J. H., with others, p.m. signal generator for 260–800 Mc/s, **1697**
Shanklin, J. P., v.h.f. aerial, with circular polarization, **1560**, with vertical polarization, **1279**
Shapiro, H., with others, ultrasonic delay lines, **2479**
Sharp, C. E., and R. E. Lacy, portable microwave communication set, **2914**
Sharpless, T. K., Hg delay lines, **673**; high-speed *n*-scale counters, **2186**
Shaw, I. J., with J. A. Ratcliffe, interaction of radio waves, **3219**
Shaw, R. F., with others, mercury-delay-line memory, **(A) 2475**
Shawe, L. W., and C. M. Burrell, direct-reading cm-λ wavemeters, **2018**; Q-meter for 10-cm echo boxes, **2005**
Shearer, D. G., and W. W. Brockway, radiovisor landing system for aircraft, **(A) 2524**
Shelton, G. R., A. S. Creamer and E. N. Bunting, Ba-Mg titanate dielectrics, **3441**
Shembel, B. K., circuit equivalent of quartz crystals, **1389**
—— with O. A. Tkhorzhevski, synchronization of valve oscillator by a harmonic, **1308**
Shepard, H. C., with W. J. Poch, television mobile unit, **1789**
Shepard, W. G., high-gain d.c. amplifier, **380**
Shepherd, W. G., with J. O. McNally, reflex oscillators for radar, **1518**
—— with J. R. Pierce, reflex oscillators, **611**
Sheppard, C. B., with others, mercury-delay-line memory, **(A) 2475**
Sheppard, P. A., structure and refractive index of lower atmosphere, **1939**
Sherman, R., light-weight waveguides, **755**
Sherrod, H. C., resonant-line coil, **72**
Shersby-Harvie, R. B. R. See Harvie, R. B. R. S.
Sherwin, C. W., short time delays in G-M counters, **2578**
Sherwood, F. L., with B. C. O'Brien, phase monitor for broadcast arrays, **1092**
Shipton, H. W., with others, demagnetizing amplifier valves to cure ripple, **3559**
Shklover, D. A., luminescent output of phosphors, **2261**
Shklovsky, I. S., galactic and solar r.f. emission, **95**
Shlyamin, B. A., radar and weather, **2254**
Shockley, W., and G. L. Pearson, effect of surface charges on thin semiconductor films, **3438**
Shone, A. B., and R. T. Fatehchand, measurement of telegraph distortion, **2857**
Shonnard, J. R., facsimile modulator photocell, **2961**
Shuffrey, A. L., with others, modulation and waveform of light beam, **1087**
Shulman, C., and M. S. Heagy, theory of travelling-wave valve, **2103, (C) 3274**
Shunaman, F., pulse-code modulation, **2828**
Shur, Ya. S., and A. S. Khokhlov, thermomechanical treatment of ferromagnetic materials, **1062**
—— and A. A. Lukshin, magnetization and magnetostriction curves of alsifer alloys, **1984**
—— with others, effect of rust and recrystallization on soft magnetic materials, **1983**
Sichak, W., and S. Milazzo, aerials for circular polarization, **3343**, and elliptical polarization, **(A) 342**
Siesen, G. J., and F. Kerkhof, home projection television, **2387**
Siforov, V. I., u.h.f. amplifiers, noise in, **3067**, theory of, **879**
Siling, P. F., frequency allocations, **1747**
Sillars, R. W., with others, SiC nonlinear resistors, **(D) 3361**
Silver, M., monitoring equipment for f.m. broadcasting, **488, 2861**; pretuned band-pass frequency multiplier, **684**
—— and H. A. French, high-quality broadcasting radio links, **(A) 2614**
—— with others, stabilized f.m. system, **860**
Simane, C., with P. Debraine, automatic synchronization of cyclotron, **2038**
Simon, E., with F. W. Thomas, soldering Al alloys, **2827**
Simon, L., dielectric aerials, **3348**
Simons, R. F., with others, stabilized airborne magnetometer, **798**
Simpson, A. I. F., design of small single-layer coils, **963**
Simpson, O., conductivity of PbSe films, **1876**
—— G. B. B. M. Sutherland and D. E. Blackwell, PbTe photocells, **2660**
—— with others, PbSe photocells, **1815**
Simpson, S. H., Jr, and R. E. Hammond, facsimile standards, **1772**
Sinclair, D. B., measurements at v.h.f., **1408**
Sinclair, G., E. C. Jordan and E. W. Vaughan, aerial radiation pattern measurements using models, **1276**
Singh, R. N., with S. S. Banerjee, F_2-layer electron density near equator, **2239**
Singleton, H. E., with R. S. Bailey, reducing transmission bandwidth, **3539**
Sittel, K., with E. Menzer, f.m. radiosonde, **(B) 2588**
Sittkus, A., effect of magnetic storm on cosmic radiation, **3113**
Sivian, L. J., ultrasonic absorption in air and other gases, **914**
Skellett, A. M., radial beam valve with e.s. focusing, **(A) 2363**
Skifter, H. R., and J. S. Prichard, aerial pattern measurement, **2727**
Slack, C. M., and L. F. Ehrke, high-speed radiography, **1715**
Slater, D., with C. F. Bays, hermetic sealing of transformers, **749**
Slaughter, R. J. H., with D. Maurice, f.m. reception, **2345**
Slaymaker, F. H., and W. F. Meeker, blind guidance by ultrasonics, **(A) 2578**
—— with L. L. Merrill, directional characteristics of clamped-edge disk, **3288**
Sleeper, M. B., f.m. television relay *vs* coaxial cable, **2370**; U.S.A. facsimile service possibilities, **268**
Slepyan, L. B., sensitivity of receivers, **3232**
Slichter, L. B., and E. C. Bullard, Frenkel's theory of geomagnetism, **(D) 104**
Sliškovic, J., miniature radio components and receivers, **1339**
Slonczowski, T., with others, airborne magnetometers, **220**
van Slooten, J., with P. Cornelius, improved diversity and directive broadcast reception, **255**
Slutsker, M. A., and M. A. Studitski, noise meter for broadcasting stations, **3189**
Slutskin, A. A., oscillation mechanism in multi-segment magnetron, **1839**
Smale, J. A., developments in point-to-point communication, **2358**
Smith, A. H., automatic a.f. phase reverser, **677**
Smith, C. B., with others, wide-range u.h.f. signal generators, **776**
Smith, C. E., standard reference aerials, **951**
—— and R. A. Fouty, circular-polarization f.m. aerial, **(A) 2443**
—— and E. M. Johnson, performance of short aerials, **651**
Smith, C. P., wide-band wobbulator, **1310**
Smith, E. H. Frost, magnetic amplifiers, **3359**
Smith, F. W., Jr, and M. C. Thienpont, l.v. high-current stabilized power supplies, **283**
Smith, H. R., and G. S. Gregory, film pickup system, **2945**
Smith, J. P., with others, barrier-grid storage c.r. tubes, **2986**
Smith, J. R., television field equipment, **2938**
Smith, J. S., loudspeaker damping, **(D) 938**
Smith, K. D., with J. F. Wentz, microwave television transmission system, **2653**
Smith, Newbern, with J. H. Dellinger, war-time work of I.R.P.L., **2049**
Smith, O. J. M., β ray thickness gauge for sheet steel, **497**; post-war engineering curriculum, **902**
Smith, P. H., cloverleaf aerial for f.m. broadcasting, **1272**
Smith, R. A., radar navigation, **1959**; Radio Aids to Navigation, **(B) 1048**
—— E. Franklin and F. B. Whiting, group velocity of radio waves in atmosphere, **1438**
Smith, R. W. K., with others, teleran, **1647**
Smith, T., 75-W R/T and c.w. transmitter, **1802**
Smith, W. B., recording sky-wave signals, **778**
Smith, W. V., and R. L. Carter, microwave absorption of NH_3, **(D) 406**
—— and others, frequency stabilization of microwave oscillators by spectrum lines, **2180**
—— with R. L. Carter, microwave spectrum frequency markers, **1353**
Smith-Rose, R. L., I.E.E. convention on scientific radio, **3282**
—— and A. C. Stickland, effect of meteorological conditions on u.s.w. propagation, **2061**
Smitley, C. R., l.f. portable amplifier, **377**
Smyth, C. N., and R. C. Roach, dielectric measurements at cm λ, **1994**
Smyth, J. B., and L. G. Trolese, radio propagation in lower troposphere, **801**
Snoek, J. L., anomalies in magnetization of bars, **3432**; effective length of Barkhausen discontinuity, **3091**; factors determining permeability, **3427**; gyromagnetic resonance in ferrites, **135**; initial permeability of Fe, **3136**; New Developments in Ferromagnetic Materials, **(B) 3447**
—— and J. F. Fast, metastable states of Ni, **3429**
—— with G. W. Rathenau, magnetic anisotropy in Ni-Fe alloys, **3428**
Snyder, H. S., and J. R. Platt, principles of optical communication systems, **2909**
Snyder, R. L., large-scale computers, **(A) 2548**
Sobel, A., short telephone lines, frequency response improvement, **650**
Soderman, R. A., impedance-measurement bridge for 20–140 Mc/s, **(A) 181**
Sokolov, I. T., circle diagrams in transmission line problems, **1250**
Solari, L., invention of aerial, **(D) 1218**
Solley, B. J., frequency control of RC oscillator, **49**
Soloviev, G. F., with others, efficiency of valve oscillator, **1809**
Sondheimer, E. H., thermoelectric power of metals, **704**
—— with others, conductivity of metals at microwave frequencies, **(D) 2768**
Sorkin, I. M., with G. V. Dlugach, measurement of deviation ratio in f.m., **1404**
Sorokin, V., spherical e.m. waves, **3094**
Sorokina, V. V., and P. V. Timofeev, shape of field for e.s. lenses, **2880**
Sosnowski, L., excess-defect semiconductor contacts, **443**
Sotskov, B. S., thermistors, **3036**
Soucy, C. I., frequency stability of oscillatory circuits, **1581**; temperature-coefficient effects of coil finishes, **1610**
Soule, R. R., with R. S. Mackay, Jr, watch timer, **1669**
Sowerby, J. McG., Radio Data Charts, **(B) 3285**; shunt voltage stabilizer, **2929**
Sowton, C. W., with F. Hollinghurst, v.h.f. point-to-point communication, **2080, (D) 3515**
Spangenberg, K., G. Walters and F. W. Schott, network analyser for study of e.m. fields, **(A) 2475**
Spangenberg, K. R., Vacuum Tubes, **(B) 3279**
Sparks, S., and R. G. Kreer, radiotelegraph tape relay system, **539**
Spayne, A. J., with others, pinhole radiography of magnetrons, **2670**
Spence, R. D., diffraction of sound by circular disks and apertures, **3294**
Spencer, R. C., W. Ellis and E. C. Fine, reflectors for wide-angle scanning at cm λ, **(A) 2443**
Sperduto, A., with others, e.s. accelerator for electrons, **1120**
Spilsbury, R. S. J., and A. Felton, millisecond chronoscope, **465**
Spindell, F. A., Browning RV-10 f.m. tuner, **3236**
Spooner, A. M., zero setting of waveform monitor, **(D) 480**
Squier, R. T., calorimetric measurement of anode dissipation, **(A) 188**
Sreekantan, B. V., with S. K. Chatterjee, u.h.f. absorption by salt solution, **3069**
Stacy, J. D., watt-second rating of d.c. capacitors, **42**
Stadlin, R., transfer coefficients of electroacoustic systems, **325**
Stager, H., hardening of synthetic materials in h.f. fields, **2822**
Stainsby, A. G., with others, high power pulsed magnetron, development, **882, (D) 3566**
Standring, W. G., with R. Davis, discharge currents in kite-balloon cables, **1034**
Stanesby, H., and P. W. Fryer, variable-frequency crystal oscillators, **2194**
—— and G. H. M. Gleadle, prediction of optimum transmission frequencies, **516**
Stanier, H. M., with A. H. Brown, v.h.f. aerials for short distances, **3340**
Stanley, G. J., with J. G. Bolton, r.f. radiation from constellation of Cygnus, **2514**
Stanley, R. J., Schering bridge Type D-98-A, **3462**
Stansel, N. R., induction heating, application, **2872**, practical application of formulae for, **2085**
Stanworth, J. E., with A. E. Dale, solder glasses, **3445**
—— with G. D. Redston, effect of temperature and/or humidity on seal stresses, **2799**
Starkie, D., plastic lenses for television projection, **3154**; plastic mirrors and lenses, **756**
Starnecki, B. J., aerial gain and polar diagrams, **(D) 2461**; selective demodulation, **(D) 686**; synchrodyne receiver, **(D) 1139**
—— with J. S. McPetrie, low-level atmospheric ducts, **2329**
Starner, C. J., 50-kW f.m. transmitter, **2957**
Starobinski, A. I., dielectric constants of solid dielectrics at cm λ, **1993**
Starr, A. T., cm-λ high-power pulse communication, **2627**
Staub, F., Kettenförmige Ultrakurzwellen-Bandfilter aus Quasistationären Schwingtöpfen, **(B) 697**
Stedman, C. K., design of a.m. subcarrier telemeter systems, **1989**
Stegmaier, E., with R. Feldtkeller, complex permeability of coil cores, **3137**, with [illegible], **2808**
Steinberg, E. B., with H. D. Doolittle, industrial heating, valve operating conditions, **3275**
Steinberg, J. L., h.f. energy from ionized gas, **1623, 1808**
Steinmaurer, R., with H. Gheri, 27-day period of cosmic rays, **716**
Stenning, L. C., with D. M. Heller, crystal-controlled v.h.f. equipment, **2616, (D) 3509**
Sterling, H. T., diode contact potential for negative bias, **353**
Sterns, W. G., with others, High Frequency Measuring Techniques using Transmission Lines, **(B) 2030**
Stetson, H. T., Sunspots in Action, **(B) 1954**; sunspots and radio, **2604**
—— with G. W. Pickard, troposphere propagation and weather, **1453**
Stevels, J. M., physical properties and structure of glass, **2829**; scale glass as mica substitute, **2823**
Stevens, B. J., and L. J. Middleton, a.m. *vs* f.m. for broadcasting, **261**
Stevens, S. M., with M. Rettinger, sound reinforcement in the Hollywood Bowl, **1544**
Stevens, S. S., J. P. Egan and G. A. Miller, measuring speech spectra, **924**
—— with others, Hearing Aids, **(B) 2714**
Stevenson, A. F., transmitting and receiving properties of aerials, **3023**
Stewart, G. S., with J. S. Hey, radar observations of meteors, **411**
—— with others, radio observations of Giacobinid meteor shower, 1946, **2781**
Stewart, H. E., feeds for beam aerials, **2733**
Stewart, K. H., loss measurement in small ferromagnetic samples, **178**
Stickland, A. C., lower-atmosphere refraction, **1940**
—— with R. L. Smith-Rose, effect of meteorological conditions on u.s.w. propagation, **2061**
Stifler, W. W., Jr, and W. F. Saars, sofar [sound fixing and ranging], **2797**
Stigant, S. A., Modern Electrical Engineering Mathematics, **(B) 161**; $Y^{\alpha\beta}$ for junction networks, **676**
Stites, F. H., omnidirectional 6-m aerial, **655**
Stockman, H., reflected-power communication, **(A) 2614**; superregenerative circuit applications, **1591**
Stodola, E. K., and H. Lisman, flat-plate transmission-lines as v.h.f. reactors, **2477**
Stoffregen, W., direction finder for atmospherics, **3122**
Stokes, V. O., transmitters in parallel, **3270**
Stone, A. M., and J. L. Lawson, infinite-rejection filters, **385**
Stone, R. P., with others, pulse triode for 200 kW at 600 Mc/s, **2866**
Stoner, E. C., ferromagnetism, **3395**
—— and E. P. Wohlfarth, high-coercivity ferromagnetic materials, **1053**
Strafford, F. R. W., and J. N. Pateman, television aerials, close-spaced arrays, **(D) 29**
Straitiff, G., GR-S rubber, **148**
Straiton, A. W., and J. R. Gerhardt, horizontal angle-of-arrival measurements for λ 3.2 cm, **3225**
Strecker, F., theory of quadripole chains, **1577**
Strivens, M. A., with D. F. Rushman, permittivity of porous samples of $BaTiO_3$, **2262**
Strong, C. E., radiolocation, system classification, **(A) 1039**
Strutt, M. J. O., gain and noise figures at v.h.f. and u.h.f., **1599**; Ultra- and Extreme-Short Wave Reception, **(B) 2074**
—— and K. S. Knol, magnetic permeability and Weiss domains, **3089**
—— and A. van der Ziel, compensation of shot effect in valves and circuits, **3358**; v.m. valves as u.h.f. preamplifiers, **1890**
Stryker, N. R., with H. F. Hopkins, loudness-efficiency rating of loudspeakers, **2152**
Studitski, M. A., with M. A. Slutsker, noise meter for broadcasting stations, **3189**
Stumpers, F. L., with W. Nijenhuis, properties of networks, **3364**
Stumpers, F. L. H. M., impulse-noise transients in f.m. receivers, **3505**; interference problems in f.m., **1147**; network distortion of f.m. signal, **1886**; nonlinear noise problem, **2350**
Sturgess, H. E., with others, radio transmitting station at Criggion, **2371**
Sturley, K. R., frequency modulation, **(D) 3512**; heterodyning and modulation, **(D) 1145**; short-circuited turns, **3379**
Stuzzi, V., Merkur,-W receiver, **1463**
Suart, R., hot-cathode Hg-vapour rectifiers, **1208**; saturation curves of transmitting valves, **618**; u.s.w. valves and circuits, **2412**
Sucher, M., with others, geometry for ridged waveguide, **(A) 2443**
van Suchtelen, H., measuring watch rate error with c.r.o., **2838**
Suckling, E. E., differential input circuits, **1594**
Suetin, T. A., oscillations in low-pressure arc discharges, **1348**
—— with V. L. Granovski, oscillations in low-pressure discharge, **1347**
Sullivan, H. M., vacuum pumping equipment, **2256**
Sulzer, P. G., cathode-coupled negative-resistance circuit, **3372**; diode noise-generator for receiver measurements, **3192**; high-power ionosphere-measuring equipment, **2294**
Summers, W. P., with A. S. Meier, impedance of vertical aerials over finite ground planes, **(A) 2443**
Sunstein, D. E., photoformer, **(A) 2475**
Surdin, M., with R. H. Kay, transmitter-blocker cells for cm waves, **1768**
Sutherland, G. B. B. M., and E. Lee, infra-red developments, **3473**
—— with E. F. Daly, infra-red spectroscope with c.r. presentation, **(D) 493**
—— with others, PbSe photocells, **1815**; PbTe photocells, **2660**
Sutro, P. J., with E. G. Fubini, wide-band transformer from unbalanced to balanced line, **662**
Svartholm, N., focal length formula for long magnetic lens, **2877**
Swaffield, J., vocoder for long-distance telephony, **2911**
—— with R. J. Halsey, vocoder telephony system, **(A) 2910**
Swingle, D. M., with R. Wexler, radar storm detection, **433**
Sykes, R. A., h.f. plated quartz crystal units, **1877**
Symonds, J. L., with W. D. Allen, multiple-gap linear electron acceleration, [illegible]
—— with others, theory of proton synchrotron, **209, (C) 507**
Synek, E., energy transformation in electrodynamic loudspeakers, **2703**
Synge, J. L., boundary problems in mathematical physics, **1392**
Sze-Hou Chang See Chang, Sze-Hou.
Székely, N., with P. Selényi, effect of bending on Se rectifiers, **86**
Szepesi, Z., slot aerials, **1561**
Szigeti, G., luminescent materials, **(C) 1649**
—— and E. Nagy, conductivity and fluorescence of $ZnSiO_3$, **1051**
—— E. Nagy and E. Makai, activation of fluorescence by Mn ions, **1375**
Sziklai, G. C., R. C. Ballard and A. C. Schroeder, experimental simultaneous colour television system, **572**

T

Tait, C. R., automatic tracking radar, SCR-545-A, **2530**
Taft, E., with others, wide-range double-heterodyne spectrum analyser, **769**
Tagg, G. F., contact conditions in instrument jewel bearings, **410**
Tai, C. T., coupled aerials, **2450**
Talley, B. B., radar for river navigation in fog, **425**
Talley, C. E., and R. W. Kautzky, sound reinforcement for theatres, **2697**
Talpey, R. G., and H. Goldberg, microwave frequency standard, **483**
Tank, F., with W. Gerber, high altitude radio stations and links, **546, 2632**
Tannenbaum, J., 28-Mc/s weak-signal converter design, **1485**
Tarzian, S., Hifam h.f. a.m. broadcasting in U.S.A., **3523**
Tasny-Tschiassny, L., chain-relaxation method of network analysis, **3365**
Taylor, A., rotating-anode X-ray tube, **3485**
Taylor, D., and C. H. Westcott, Principles of Radar, **(B) 3419**
Taylor, W. G., with G. A. Miller, perception of repeated bursts of noise, **2138**
Tellegen, B. D. H., coupled circuits, **384**
—— and J. Haantjes, diode as convertor or detector, **3360**
Tellier, J. C., impulse noise generator for testing f.m. receivers, **1418**
—— and J. F. Fisher, testing long-persistence screens, **1652**
Teltscher, E. S., f.m. multichannel v.h.f. radio link, **263**
Teodorchik, K. F., nonlinear theory of RC generators, **1299**; oscillators with bridge circuit, **360**; theory of blocking oscillators, **1305**; theory of RC ladder-type oscillators, **1307**
Tepper, J., with M. J. Kobilsky, ripple current in half-wave rectifiers, **1538**
Terlecki, R., and J. W. Whitehead, portable substandard of frequency, **3168**
Terman, F. E., Radio Engineering, **(B) 2896**
Terrien, J., and C. Anglade, addition law for Se photocell, **1801**
—— C. Anglade and G. Touvay, local sensitivity variations of photocells, **1814**
Tetel'baum, S. I., directive receiving aerial system, **2175**

Thackeray, A. D., short-lived high-latitude solar flocculus, **97**
Thaler, W. J., with others, distortion of ultrasonic waves, **2999**
Thali, H., Technical Dictionary, (**B**) **906**
Thayer, G. N., microwave radio relay system, **1754**
Thiede, H., generation of out-of-phase voltages, **2738**; phase equalization, **1873**
Thiemann, H., large-screen television projection, **296**
Thienpont, M. C., with F. W. Smith, Jr, l.v. high-current stabilized power supplies, **283**
Thomas, A. M., ceramics with low temperature coefficient, **455**
Thomas, D. E., phase tables for unit attenuation slope, **968**
Thomas, D. G. A., with others, scale-of-100 counter, **2306**
Thomas, F. W., and E. Simon, soldering Al alloys, **2827**
Thomas, H. A., and R. E. Burgess, Radio Research Special Report No. 15: Radio Noise, (**B**) **534**
—— and R. G. Chalmers, ionospheric height recorder, **2240**
Thomas, H. P., and L. M. Leeds, f.m. transmitter performance measurements, **1694**
Thomasson, D. W., design of industrial electronic apparatus, **2313**; Ruben-Mallory Hg cell, **2645**; Service-surplus c.r. tube data, **1835, 3561**
Thompson, G., design of ground-plane aerial, **1262**; push-pull resonant-line oscillator for 166–170 Mc/s, **1586**
Thompson, G. M., characteristics and circuits for Type 807 valve, **1831**
Thompson, L. E., microwave propagation experiments, **2894**
Thompson, N. J., and E. W. Cousins, measuring pressures of explosions, **787**
Thomsen, I. L., notes on aurora australis, **1953**; proposed auroral index figure, **1952**; solar radio emission and sunspots, **2228**
Thomson, J., total emission damping, **3554**
—— and others, u.h.f. mobile and fixed communications, **2081**, (**D**) **3514**
Thorn, D. A., with G. J. McDonald, radiation from ships' receivers, **2352**
Thourel, L., dielectric heating, **2036**; negative feedback in amplifiers, **1605**
Thurnauer, H., properties and uses of ceramics, **1391**
Thurston, J. N., with others, packaged amplifiers, **2207**
Tibbs, C. E., Frequency Modulation Engineering, (**B**) **558**
Tibbs, S. A., with A. H. Beck, automatic polar diagram recorder, **1400**
Tiberio, U., signal/noise ratio, in l.f. amplifiers, **1320**, in oscillographic receivers, **2070**
Tickner, A. J., with others, airborne magnetometers, **220**
Tikhonov, A.N., with A. A. Samarski, excitation of waveguides, **3335**
Tillman, J. R., valve oscillator, **976**
Tillotson, L. C., with W. D. Lewis, branching filter for microwaves, **2216**
Tilton, E. P., 420-Mc/s transmitter and superregenerative receiver, **1509**
Timofeev, P. V., with V. V. Sorokina, shape of field for e.s. lenses, **2880**
Titterton, E. W., and V. L. Fitch, portable pulse generator, **2301**
Tkhorzhevski, O. A., and B. K. Shembel, synchronization of valve oscillator by a harmonic, **1308**
Todd, F. J., VOR aerial navigation system, **3123**
Todd, W., d.f. receiving system for meteorology, (**A**) **2524**
du Toit, S. J., anticoincidence and recording circuit, **1706**; self-quenching G-M counters, **3198**
Tolansky, S., and W. Bardsley, interferometry for study of quartz oscillations, **3400**
Tomasevich, O. F., with S. I. Pekar, thermionic emission from metals covered by semiconductor, **3391**
Tomkins, A. A., surgeless volume expansion, **2739**
Tomlin, G. M., with H. C. Turner, electrical technique in other industries, **1110**
Tomlin, S. G., principles of v.m., **893**
Tommasini, E., d.c. valve voltmeters, **2008**
Torrey, H. C., and C. A. Whitmer, (Eds), Crystal Rectifiers, (**B**) **2989**
Touraton, —, — Zwobada and — Dumousseau, wide-band amplifier valves for cm λ, **1834**
Tournier, M., growing of piezoelectric crystals, **1657**; physical properties and symmetry of crystals, **2811**
Toussaint, M., and A. Sev, synchronization of broadcasting networks, **260**
Touvay, G., with others, local sensitivity variations of photocells, **1814**
Townes, C H., microwave absorption of NH_3, (**A**) **407**
—— and F. R. Merritt, Stark effect in h.f. fields, **1344**
Townsend, G. B., with others, television receiver design, **1187**
Tranter, W. O., diffraction of e.m. waves, **2326**
Traub, E., with W. E. Bradley, Philco television projection, **295**, receiver, **512**
Tremellen, K. W., and J. W. Cox, wave propagation and s.w. communication, **2050**
Trestchenkoff, G., s.w. reception with commercial receiver, **523**
Triem, W. R., portable R/T for trains, **1164**
Trillat, J. J., and J. Barraud, measurement of peak voltages by electron diffraction, **165**
Trischka, J. W., with others, magnetic amplifiers, **664**
Troitski, V. S., use of c.r.o. to indicate bridge balance, **2011**
Trolese, L. G., with J. B. Smyth, radio propagation in lower troposphere, **801**
Trump, J. G., with others, e.s. generators, **3483**
Tuck, J. L., with others, 16-MeV betatron, **3482**
Tucker, B. A. C., with J. Dyson, contour plotter for directive aerials, **1864**
Tucker, D. G., analysis of ring and Cowan modulators, **3543**; design of balanced rectifier modulators, **3542**; performance criteria for pulse and television amplifiers, (**A**) **373**; rectifier resistance, exponential law, **1868**; synchrodyne receiver, **1138**, (**D**) **1139**, **1140**, design of, **525**; two-phase telecommunication system, **2912**
—— and J. Garlick, synchrodyne, refinements and extensions, **1733**
—— and J. F. Ridgway, design of synchrodyne receiver, **526**
—— with J. H. P. Draper, square-law circuit, **670**
Tucker, W. J., and R. S. Roberts, Plastics for Electrical and Radio Engineers, (**B**) **1066**
Tuckerman, B., magnetic screening by spherical shell, **705**
Tuller, W. G., bandwidth reduction in communication systems, (**A**) **2614**
—— and T. P. Cheatham, Jr, adjustable-bandwidth f.m. discriminator, **239**
—— W. C. Galloway and F. P. Zaffarano, frequency stabilization of microwave oscillators, **3055**
Turner, C., and others, Berkeley 4-MeV e.s. generator, (**A**) **2311**
Turner, H. C., and G. M. Tomlin, electrical technique in other industries, **1110**
Turner, L. A., with others, Radar Aids to Navigation, (**B**) **2255**
Turner, L. B., balanced 3000- and 10000-Mc/s calorimeters with tapered water loads, **2023**
Turner, R. J., with others, crystal oscillators, **2195**
Turner, R. P., pocket valve voltmeter, **1687**; 600-W R/T transmitter, **1199**
Turney, T. H., synchrodyne receiver, (**D**) **1139**
Tuthill, C. A., interpreting system at Lake Success, **637**
Tuttle, W. N., use of diode rectifiers for d.c. motor speed control, (**A**) **2574**
Tweedy, S. E., magnetic amplifiers, **1566**
Tyrrell, W. A., waveguide hybrids, **678, 2165**
—— with G. E. Mueller, polyrod aerials, **952**
Tyson, B. F., h.f. crystal voltmeter, **2284**
Tyzzer, F. G., and H. C. Hardy, felt as noise and vibration reducer, **929**
Tzu, H. Y., magnetic field of rotating bodies, **1633**
Ts'u, Y. K., with Chai Yeh, frequency deviation in reactance-valve f.m. circuits, **2751**

U

von Ubisch, H., hot-wire vacuum gauges, **436**
Uhlig, H. H., passivity in Cr-Fe alloys, **744**
Ullrich, E. H., and D. C. Rogers, measurement of receiver noise factor, **1743**
Underhill, E. M., permanent-magnet alloys, **1663**
Ungvary, R. L., with H. J. Reich, a.f. and ultrasonic frequency meter, **2292**
Urick, R. J., absorption of sound in suspensions, (**A**) **2119, 2685**; measurement of underwater sound velocity, (**A**) **634**
Uslan, S. D., with J. F. Rider, F. M. Transmission and Reception, (**B**) **3526**
Uttley, A. M., with F. C. Williams, the velodyne, **962**
Uzkov, A. I., directive aerial design, **958**

V

Vacquier, V., R. F. Simons and A. W. Hull, stabilized airborne magnetometer, **798**
Valle, R. B., Jr, with R. E. Zenner, magnetic tape recorder, **3010**
Valentin, A., amplidyne, **3527**
Vallarino, A. R., with others, stabilized f.m. system, **860**
Vallarta, M. S., magnetic field of Milky Way and effect on cosmic radiation, **100**
de Valroger, L., broadcast receiver input circuits, **2068, 2897**
Vance, P. A., saturable reactors for load control, **665**
Van de Graaff, R. J., J. G. Trump and W. W. Buechner, e.s. generators, **3483**
—— with others, e.s. accelerator for electrons, **1120**
Vanderlippe, R. A., frequency-shift radio-teletypewriter, **1493**
Van Duyne, J. P., and M. E. Clark, a.f. square-wave analysis, **1081**
Van Scoyoc, J. N., and J. L. Murphy, electronically controlled reactance, (**A**) **2475**
Varley, W. E. C., B.B.C. variable-frequency drive equipment, **1806**
Vasseur, J. P., Huyghens' principle and diffraction, **1618**
Vaughan, E. W., with others, aerial radiation pattern measurements using models, **1276**
Vaughan, J. F. O., general-purpose c.r.o., **2564**
Vaughan, W. C., use of circle diagrams, **337**
Vergunas, F. I., and F. F. Gavrilov, photoluminescence of ZnO, **1374**
Verwey, E. J. W., electronic conductivity of non-metals, **84**
—— P. W. Haayman and F. C. Romeyn, semiconductors with large negative temperature coefficient of resistance, **2265**
Vestine, E. H., and others, Description of the Earth's Main Magnetic Field and Its Secular Change, 1905–1945, (**B**) **1645**
Vick, F. A., emission from oxide cathodes, **2974**
Vickerman, P. N., insulating materials for electrical machines, **751**
Villard, O. G., Jr, single-sideband reception, **2597**
Ville, J., theory and applications of analytical signal, **1293**
—— with P. Herreng, impedance irregularities of coaxial cables, **2162**
Vincent, G., tuning band of reflex klystron, **2672**
Vincent, R., with others, 100-kc/s magnetostrictive transducer, (**A**) **3329**
Vink, H. J., with R. Loosjes, characteristics of oxide cathodes under pulse conditions, **2414**
Violet, P. G., characteristic impedance of cable junctions, **2717**; u.s.w. propagation, **1450**; wave propagation in metal tubes, **1554**; 3-stage coupling filter for wide-band amplifiers, **3073**
Vladimir, L. O., permeability tuning of broadcast receivers, **71**
Vladimirski, V. V., cavity resonators coupled through small aperture, **2197**, propagation in, **2198**
Voce, E., copper and copper alloys, **1664**
Voge, J., meteorological effects on u.s.w. propagation, **2060**; propagation in waveguides and in atmospheric ducts, **1719**
—— with R. Rigal, waveguide theory for plane waves, **1553**
Voge, J. P., v.h.f. amplifiers using travelling-wave valves, **66**
Voigt, P. G. A. H., loudspeaker damping, (**D**) **938**
Voisin, A., with A. Rogozinski, measurement of efficiency of G-M counters, **496**
Vollerner, N. F., oscillator with external amplitude limiter, **2201**
Vol'man, I. L., excitation of rectangular waveguide through slot, **3017**
Vol'pert, A. R., efficiency of h.f. feeders, **349**
Vonberg, D. D., with M. Ryle, solar radiation, r.f., **2784**, at 80 and 175 Mc/s, **96**
Vonsovski, S. V., ferromagnetism of binary alloys, **1974**
Vormer, J. J., artificial electrical twinning in quartz, **142**; filter crystals with low self-inductance, **388, 3072**
Vowels, R. E., matrix methods for ladder networks, **2189**
de Vries, G., cavity resonators, **975**
Vul, B. See Wul, B.

W

Wadachi, K., geomagnetic data, Japan, **717**
Waddel, R. C., electric-field meter for aircraft, **2287**
Wadley, T. L., with others, frequency prediction for South Africa, **229**
Waer, R., with others, communication by reflection from moon, (**A**) **547, 2915**
Waesche, H. H., sources of quartz crystals, **2813**
Wagener, W. G., u.h.f. transmitting tetrode design, **2981**
Waggoner, L. T., 350-W c.w. and telephony transmitter, **538**
Wagner, R., embossing recorder, **942**
Waidelich, D. L., full-wave rectifier and capacitive input filter, **73**
Waithman, V. B., with K. R. MacKenzie, r.f. system for f.m. cyclotron, **1712**
Wakeman, R. P., with T. T. Goldsmith, Jr, field coverage of New York television stations, (**A**) **2647**
Wald, S., inductive coupling of aerials, **953**
de Walden, S., signal/noise ratio in radar, (**D**) **1739**
Waldmeier, M., coronal radiation and ionosphere variations during eclipse, **728**; final relative sunspot numbers for 1946, **1922**; provisional sunspot numbers, April–June 1947, **713**, July–Sept. 1947, **1923**
Walker, A. C., piezoelectric ADP crystal culture, **2535**
Walker, A. H. B., television h.v. supply, **2390**, (**C**) **2947**
Walker, G. D., radio communication for South African railways, (**D**) **2925**
Walker, H. P., uses of silicones, **147**
Walker, P. J., loudspeaker damping, (**D**) **13**
Walker, R. A., with others, voice measurements with audio spectrometer, **3016**
Walkinshaw, W., with others, field near centre-fed λ/2 slot aerial, **3345**; travelling-wave linear accelerator for electrons, **506**
Wallenstein, J. P., with others, triode for 600 Mc/s, **877**
Waller, W. E., S. Hopfer and M. Sucher, geometry for ridged waveguide, (**A**) **2443**
Wallis, P. J., principles of v.m., **893**
Wallman, H., stagger-tuned amplifier design, **2491**
—— A. B. Macnee and C. P. Gadsden, cascode low-noise amplifier, (**A**) **2475, 3061**
Walter, W. Grey, H. W. Shipton and W. J. Warren, demagnetizing amplifier valves to cure ripple, **3559**
Walters, O., with others, network analyser for study of e.m. fields, (**A**) **2475**
Ware, L. A., with H. B. Phillips, transit-time effect in klystron gaps, **898**
Ware, P., inductive tuning unit for f.m. television receivers, **2069**
Warmoltz, N., ignition mechanism of Hg-cathode igniters, **830**
Warnecke, R., P. Guenard and C. Fauve, effects of space charge in two-cavity klystron, **612**
Warner, A. J., electrical properties of plastics, **3443**
Warren, G. W., with others, u.s.w. triodes and oscillators, **683**
Warren, W. J., and W. R. Hewlett, intermodulation method of distortion measurement, **2553**
—— with others, demagnetizing amplifier valves to cure ripple, **3559**
Wass, C. A. A., table of intermodulation products, **2188**
Waterton, F. W., voltage distribution in multi-stage electron accelerator, **3205**
Watson, A., 12-channel recorder, **503**
Watson, A. G. D., G. Hanson and J. H. Jones, v.h.f. aerials for naval communications, **3341**
—— J. H. Jones and D. L. Owen, common-aerial working for v.h.f. systems, **3520**
—— with others, v.h.f. cross-channel communication, **3497**
Watson, D., with S. A. W. Jolliffe, h.f. direction finders, **2246**
Watson, F. S., with others, naval fire-control radar, (**D**) **732**
Watson, S. N., with others, land-line technique for television outside broadcasts, **3536**
Watson, W. H., directional couplers for waveguides, (**D**) **2719**
Watson-Watt, R., radio aids to navigation, **2250**
Watters, R. L., with others, flat-response single-tuned i.f. amplifier, **2496**; wide-range double-heterodyne spectrum analyser, **769**
Watton, A., Jr, duct capacitors, **2474**
Watts, R. J., and D. Williams, microwave absorption, double-modulation method, **1017**
Waye, W. W., television installation, **2091**
Waynick, A. H., u.s.w. propagation beyond horizon, **803**
—— with L. E. Hacke, Jr, restricted-range sky-wave transmission, **3220**
Webb, J. B., unwanted radiations from broadcast transmitters, **2098**
Weber, E., with E. Peskin, d.c. characteristics of microwave bolometers, **2862**
Webking, H. E., valve characteristics on c.r.o., **772**
Webster, E. W., with others, Van de Graaff e.s. generator, **3258**
Wecker, L. S., and F. Cooter, television receiver construction using BC-412 c.r.o., **303**
Weekes, K., and M. V. Wilkes, atmospheric tides and resonance theory, **1938**
van Weel, A., coupling of valves at u.h.f., **993**
Wegmann, L., a.f. measurement of small variations of capacitance and phase angle, **1078**
Weider, G., with E. Juisrud, speech-input equipment for Oslo Broadcasting House, **3008**
Weidner, R. T., with R. G. Fellers, admittance matching with irises, **649**
Weighton, D., impulsive interference in a.m. receivers, **2901**
Weil, L., coercive field of ferromagnetic powders, **134**
Weimer, P. K., and A. Rose, electron motion in uniform magnetic field, **709**
Weiner, J. R., C. F. West and J. E. DeTurk, design of large-scale digital computer, (**A**) **2548**
Weinstein, A., with J. B. Diaz, Schwarz' inequality, **1069**
Weinstein, J., with R. Wexler, attenuation of cm waves by rain, **2332**
Weinstein, L. A., plane open-ended waveguide, **3336, 3337**; shot effect in cylindrical diodes, **1829**
Weiss, A., with R. D. Huntoon, synchronization of oscillators, **1309**
Weiss, K., properties of CdS layers, **3147**
Weisskopf, V. F., production process of mesons, **101**
Weller, B. L., with others, printed vitreous-enamel components, **1003**
Wells, F. D., L network as impedance transformer, **1259**
Wells, H. B., with L. P. Neal, Varif receiver for λ 2 m, **1470**
Wells, H. W., polar radio disturbances during magnetic bays, **729**
—— with others; Ionospheric Research at College, Alaska, (**B**) **2795**
Wells, W., electronic organs, **3203**
Wels, W. C., with C. B. Aiken, d.c. amplifier for signals $<1\mu V$, **381**
Wendt, K. R., television d.c. component, **2939**
—— G. L. Fredendall and A. C. Schroeder, experimental simultaneous colour television system, **572**
Wenke, J. W. G., with F. de Fremery, broadcasting programme monitoring equipment, **1500**
Wentz, J. F., and K. D. Smith, microwave television transmission system, **2853**
West, C. F., with others, design of large-scale digital computer, (**A**) **2548**
West, H. M., with C. J. Dorr, relay control circuits for stepping switches, **1573**
West, W., and others, radio transmitting station at Criggion, **2371**
Westberg, R., harmonic problems of region between a circle and two parallel lines, **3081**
Westcott, C. H., transmission-line bridge, **2854**
—— with D. Taylor, Principles of Radar, (**B**) **3419**
Westwater, F. L., radar storm detection, **1963**
Wettstein, A., telecommunications at 5th Olympic Winter Sports, St. Moritz, 1948, **3243**
Wetzel, W. W., magnetic recording theory, **1851**
Wexler, R., and D. M. Swingle, radar storm detection, **433**
—— and J. Weinstein, attenuation of cm waves by rain, **2332**
Whale, H. A., optimum conditions of RC oscillator, **1580**
Wheeler, H. A., helical aerial for circular polarization, **1270**; limitations of small aerials, **1261**; radiation resistance of aerials, **2451**; resistance of aerial in infinite array or waveguide, (**A**) **2443**; r.f. inductance meter, **183**; superregeneration after World War II, (**A**) **2596**
—— with K. McIlwain, propagation of radio waves through ground, (**A**) **2596**
Wheeler, L. J., and K. G. Lockyer, crystal pickups, **918**
Whelpton, R. V., mobile m-λ ground-radar transmitters, **854**
—— and P. G. Redgment, c.w. long-range navigation aids, **1958**
Whinnery, J. R., and H. W. Jamieson, electron trajectories by differential analyser, **2408**
Whitby, O., transit-time effects in class-C power amplifiers, (**A**) **2475**
White, C. F., servo-system performance measurement, (**A**) **2639**
White, F. C., airborne radar, **115**
White, J. E., acoustic impedance, continuously variable, **913**, measurement of, (**A**) **2132**
—— with R. D. Fay, acoustic impedance from motional impedance diagrams, **2133**
White, R. W., with J. H. H. Merriman, f.m. for v.h.f. multichannel R/T, **3513**
White, S. J., horn loudspeakers, **3330**
White, S. Y., dangers of high-power ultrasonics, **3195**; ultrasonic applications, **1421**, in biology, **2867**, in dentistry and metallurgy, **1704**; ultrasonic load problems, **2304**; 18-kW turbo-generator siren, **922**
White, W. C., and H. S. Hickey, leak detector for pressure system, **2866**
—— and J. S. Hickey, leak detector for pressure system, **2303**
Whitehead, C. C., quiet high-gain amplifier, **2760**
Whitehead, J. B., measurement of h.f. dielectric properties, **172**
Whitehead, J. R., with G. G. Macfarlane, superregenerative receiver in linear mode, **3501**
Whitehead, J. W., additive and multiplicative mixing, (**D**) **1144**; beat frequency RC-tuned tone generator, **2569**
—— with R. Terlecki, portable substandard of frequency, **3166**
—— with others, impedance-matching transformer, **1296**
Whitfield, H. R., light-weight radar, **1004**
Whiting, F. B., with others, group velocity of radio waves in atmosphere, **1438**
Whitmar, R. M., with others, Radar Aids to Navigation, (**B**) **2255**
Whitmer, C. A., with H. C. Torrey, (Eds), Crystal Rectifiers, (**B**) **2989**
Whitmer, R. N., fields in non-metallic waveguides, (**A**) **2443**
Whittenton, J. M., with D. B. Fisk, progress in instrument design, **474**
Whittle, R., design of precision telemetering equipment, (**A**) **2574**
Wicher, E. R., with G. G. Bruck, slow TM waves in cylindrical guides, **334, 1555**
Wideröe, R., circular accelerator for heavy particles, **794**; displacing electron beam in betatron, **3206**; European induction accelerators, (**D**) **509**; radiation transformers, **792**
Widnall, F., and R. Newbound, protective finishing of electrical equipment, **1057**
Wiener, F. M., sound diffraction by rigid circular cones, **3296**
Wienert, K., magnetic data for Sikkim and Southern Tibet, **1928**
Wiggins, A. M., and F. S. Lewis, single-shear crystal pickup, **3302**
—— with J. H. Grieveson, comparative decibel meter, **1094**
Wikkenhauser, G., skiatron, **1838**
Wiklund, W. G., with others, body-baffle effects on hearing aids, **1248**
Wilchinsky, Z. W., electrode dissipation at u.h.f., **865**
Wild, R. F., variable r.f. follower system, **2088**
Wiles, W. E., Cheltenham K indices for Jan.–June 1947, **718**, July–Sept. 1947, **1930**
Wilkes, G., wavelength lenses, **1859**
Wilkes, M. V., and W. Renwick, ultrasonic memory unit for EDSAC, **3448**
—— with K. Weekes, atmospheric tides and resonance theory, **1938**
Wilkins, M. H. F., and G. F. J. Garlick, photoconduction and luminescence in ZnS, **3080**
Wilkinson, K. J. R., high-power radar modulators, **864**
—— J. L. Tuck and R. S. Rettie, 16-MeV betatron, **3482**
Williams, A. E., mica and micanite, **2814**; silicone coatings for glass insulators, **746**
Williams, C., c.w. short-distance navigation and landing aids, **1960**
Williams, D., with R. J. Watts, microwave absorption, double-modulation method, **1017**
Williams, E. M., and H. E. DeBolt, oscillator design for 180-inch f.m. cyclotron, (**A**) **2574**
—— with P. R. Aigrain, amplitude-stabilized oscillators, pseudosynchronization in, **3044**, theory, **980, 1883**
Williams, F., design of broadcasting control rooms, **3522**
Williams, F. C., radar circuit techniques, **1874**
—— and N. F. Moody, ranging circuits and linear timebase generators, **885**
—— and A. M. Uttley, the velodyne, **962**
—— W. D. Howell and B. H. Briggs, p.p.i. circuits, **1006**
—— F. J. U. Ritson and T. Kilburn, strobes and recurrence-frequency selectors, **987**
Williams, H. P., broadcast aerial, **344**
Williams, N. T., metal/ceramic vacuum seals, **120**
Williams, P. D., processing valve components, (**A**) **2663**
Williams, R. C. G., tuning devices for broadcast receivers, (**D**) **3503**
Williams, S. E., solar r.f. noise fluctuations and flares, **2522**
Williams, V. Z., infra-red instruments and methods, **2868**
Williamson, K. L., measurement of axial field in electron microscope lenses, **611**
Williamson, M., impedance measurement by Lecher wires, **2843**

Willis, E. S., band-pass crystal filter, **2215**
Willis, H. F., a.f. magnetic fluctuations, **3408**
Willcox, J. H., e.s. ills and cures of aircraft, **(D) 812**
Willshaw, W. E., and others, high-power pulsed-magnetron development, **892, (D) 3566**
—— with G. R. Newbery, feeding a linear accelerator, **3061**
Wilman, H., structure of PbS and PbSe layers, **2959**
Wilmotte, R. M., maximum directivity of aerials, **(D) 3031**
Wilner, J. T., with others, instantaneous radio audience-measurement system, **(A) 2430**
Wilson, I. G., with J. P. Kinzer, cylindrical cavity resonators, **366**
Wilson, W. R., with others, modulation of resonance lines in Cs arc, **2353**
Winch, G. T., with N. Laycock, local sensitivity variations of photocells, **2960**
Winchell, A. M., measuring equipment for flexible waveguides, **1417**
Winder, N., bass correction for moving coil pickups, **2708**
Winslow, J., matching for multiple loudspeakers, **940**
Winson, V. H., with C. Lawton, colonial telecommunication, equipment, **1150, (D) 2907**, organization, etc., **1149, (D) 2907**
Winternitz, T. W., with R. King, cylindrical aerial with gap, **3026**
Wireless World, air line radio, **1501**; Atlantic City telecommunication conference, **2357**; British subminiature valves, **2410**; broadcast receivers for schools, **241**; Bush receiver EBS4, **2895**; Bush television model T.91, **302**; distortion in speech and music transmission, **(AD) 2149**; Ekco A52 receiver, **2338**; facsimile in U.S.A., **(A) 1178**; frequency allocations for "European" region, **1156**; Guide to Broadcasting Stations, **(B) 626**; hearing aids, **(A) 1245**; invention of aerial, **1219**; klystron for λ 8–9 mm, **3277**; loudspeaker quality, **(AD) 2440**; mobile communication system for police, **1163**; mobile R/T for police and fire services, **272**; multichannel communication system, **2368**; radio compasses, **1036**; Radiomobile Model-100 receiver, **1462**; R.C.M.F. exhibition, **2218**; Sargrove-Tungsram UA55 valve, **1203**; television receiver construction, **304, 1186**; v.h.f. for aircraft, **3251**
Wiśniewski, F. J., theory of superconductivity, **3084**
Witsenburg, E. C., h.f. inductive heating, **1116**
Wittenberg, R. C., with M. J. Di Toro, parameter-adjustment method for network transients, **(A) 2475**
Witty, R., with D. G. Avery, diffusion-pump theory, **2257**
Wohlfarth, E. P., with E. C. Stoner, high-coercivity ferromagnetic materials, **1053**
Wold, H., with I. Galvenius, statistical tests of Alfvén's sunspot theory, **3105**
Wolfe, J. E., with C. E. Fay, tunable pulsed triode oscillator, **1878**
Wolff, I., and D. G. C. Luck, f.m. radar techniques, **2798, 3124**
Wood, G. W., positive-grid characteristics of triode, **3555**
Wood, H., testing of radar responders, **781**
Woodward, P. M., calculation of field over plane aperture, **2460**
Woodyard, J. R., with others, design of Berkeley linear accelerator, **(A) 2316**
Works, C. N., resonant cavities for dielectric measurements, **173**
Woroncow, A., iron-core deflecting coils for c.r. tubes, **2498**
Worssam, L. F., amateur-band receiver, **1464**
Wortman, L. A., voice-controlled relays, **1502**
Wright, B. T., with others, f.m. cyclotron, **2314**
Wright, D. A., oxide cathodes, **606**, energy levels in, **1961**; thermionic properties of thoria, **141**; work function and energy levels in insulating materials, **1980**
Wright, G. P., with others, v.m. valves, **895**
Wright, P., continuous-control thermoregulator, **791**
Wright, S. B., with N. Monk, public telephone service on trains, **(A) 2614**
—— with others, rural R T in Colorado, **2629**
Wrinch, D., Fourier Transforms and Structure Factors, **(B) 2269**
Wroe, H. N., shunt equalizer design, **2480**
Wul, B., dielectric constant of $BaTiO_3$ at low temperatures, **1382**
Wulf, O. R., and S. B. Nicholson, moon and recurrent geomagnetic activity, **3109**
van der **Wyck, C. T. F.**, single-sideband R/T apparatus of Dutch Post Office, **1158, 3510**
Wysong, W. S., with E. A. Gulbransen, oxide films on Mo, **742**, on W, **743**

Y

Yabsley, D. E., and others, solar radiation, v.h.f., **711**
—— with F. J. Lehany, solar noise at 600 and 1200 Mc/s, **3103**
Yancey, R. W., with L. F. Yntema, Ta in electronics, **440**
Yastrebov, V. A., effect of heating on luminescence of Zn-Cd phosphors, **1049**
[illegible], T. N., with V. V. Migulin, [illegible] relaxation oscillators, **3054**
Yeh, Chai, and Y. K. Tz'u, frequency deviation in reactance-valve f.m. circuits, **2751**
Yeo, D., with J. T. Kendall, magnetic susceptibility of synthetic mica, **3434**
Yngve, V., with others, cosmic rays, latitude effect, **714**
Yntema, L. F., and R. W. Yancey, Ta in electronics, **440**
Young, L., automatic boiler-control, **(A) 829**
Young, N. H., pulse-time modulation field telephone system, **2623**
Young, R. W., propagation of underwater sound by bottom reflection, **(A) 2123, 3291**
Young, W. R., with D. K. Gannett, ratio of frequency swing to phase shift in ph.m. and f.m. systems, **(A) 2430**
Young, W. R., Jr, interference at v.h.f., **3237**
Younker, E. L., with J. F. Morrison, measurement of h.f. power and impedance, **2012**
Yu, Y. P., bridge-balanced amplifiers for valve voltmeters, **2494**; superheterodyne tracking charts, **528**
Yudin, M., with N. Anton, high-altitude rectifier valve, **2659**

Z

Zaalberg van Zelst, J. J., constant amplification, **2752**
Zadeh, L. A., resonant frequencies of n-meshed tuned circuits, **(D) 681**
[illegible], F. P., with others, frequency stabilization of microwave oscillators, **3055**
Zahl, R., with R. Aschen, beat-frequency oscillator construction, **369**
Zamsky, J., c.r. B-H tracer, **177**
Zanarini, G., sensitivity of ear to phase distortion, **1547**
Zartman, I. F., with others, ultrasonic fields near diffracting edges, **3297**
Zeitlin, L. A., self-inductance of circular arc, **1015**
Zenner, R. E., and R. B. Vaile, Jr, magnetic tape recorder, **3010**
Zernov, D. V., M. I. Elinson and N. M. Levin, auto-electron emission from thin dielectric films, **88**
Zhabotinski, M. E., with S. M. Rytov, oscillations in self-oscillatory systems, **456**
Zhekulin, L. A., propagation of signals in coaxial cable, **2161**
Zheleztsov, N. A., self-modulation in valve oscillator, **3053**
Zhukova, P. N., and M. N. Mikheev, magnetic properties of Cr-Ni-Mo steel after heat treatments, **1975**
van der **Ziel, A.**, measurement of noise factors, **2860**; theory of plane diode, **2976**
—— with M. J. O. Strutt, compensation of shot effect in valves and circuits, **3358**; s.m. valves as u.h.f. pre-amplifiers, **1890**
Zimmermann, K. H., h.f. cable design, **1550**
Zinke, O., dielectric aerials, **3349**; exponential conductor as transformer, **372**; field-strength formula for long-wave propagation, **1448**; measurement of L, C and R by double potential divider, **1075**
Zucker, R. S., practical design of v.h.f. f.m. receivers, **245**
Zuhrt, H., Kirchhoff-Huyghens principle and e.m. radiation fields, **1624**
Zuvers, H. E., ignitrons in broadcast service, **2928**
Zwikker, C., sound absorption by porous materials, **3322**
—— J. van den Eijk and C. W. Kosten, sound absorption by porous materials, **3322**
—— with J. van den Eijk, sound absorption by porous materials, **3322**
—— with C. W. Kosten, absorption of sound, by compressible wall, **3321, 3323**, by porous rubber, **3324**
Zwobada, —, with others, wide-band amplifier valves for cm λ, **1834**
Zykov, I. V., aurora in Southern Siberia, **2245**

SUBJECT INDEX

SYMBOLS (A) Abstract, (B) Book Review, (C) Note of Correction, (D) Discussion

A

Abacs, for microwave relay calculations, **2891**; for oscillatory circuits of superheterodynes, **1473**; for pulse rise-time, **2492**; for resonant frequencies of cavities, **48**; for selectivity calculations, **1385**; for square-wave response of RC amplifier, **62**
Aberrations in lens and mirror systems, **2767**
Absorption (See also Ionosphere; Microwaves; Sound)
  acoustic, by compressible wall, **3321, 3323**
    measurement of, **2145**
    perforated facings for various materials, **981**
    by plywood panels, **2891**
    by porous materials, **2144, 3322**
    by porous rubber, **3324**
    by sheet of air bubbles, **2142**
    by slagwool cones, **6**
    by spheres and cylinders, **2120**
    by suspensions of particles, **(A)2119, 2685**
    use of Helmholtz resonators, **1232**
    by various materials, **928, 929, 3004**
  microwave, by air, **594**
    detection apparatus, **405**
    double-modulation detection method, **1017**
    measurement of, **708**
    of NH_3, **(A)90, 406, (A)407, 707, 1018, 1019, 3397**, collision broadening in, **3100**, pressure broadening in, **1916**
    by oxygen, **3398**
  spectra of ZnS and willemite, **3424**
  u.h.f., by salt solutions, **3098**
  ultrasonic, in air and other gases, **914**
    in fresh and in sea water, **(A)2124, (A)2125**
    in liquids, **3, 1532**
    theory of, **2774**
    in water, **4**
Acoustics (See also Absorption; Impedance; Sound; Ultrasonics)
  analogue of Sommerfeld's surface wave, **3287**
  applications, sonic airspeed indicator, **(A) 3486**
  architectural, of studios, **928, 930, 935, 3326**, and rooms, **(A) 2143**
  bibliography, **908, 1531, 2118, 2684, 3235**
  electroacoustic systems, transfer coefficients of, **325**
  end-corrections and harmonics of open organ pipes, **2126**
  engineering, elements of, **(B)1548**
  exponential horn design, **326**
  measurement of directivity factor, **(A)2131**
  signal analysis by filters, **2130**
  sound rooms, anechoic, **1231**, construction of, **6**
Aerials (See also Coupling; Transmission lines; Waveguides)
  aircraft, design of, **2457**
  broadcasting, **344**
    cloverleaf, f.m., **1272**
    directive, effect of circulating currents on efficiency, **(A)2443**
    reradiation from towers, **(A)2443**
  calculation of field over plane aperture, **2460**
  capacitance, for mains receivers, **1583**
  cathode-follower arrays, **2171**
  for circular polarization, **1560, 3343**
    helical, **1210**
  circularly and elliptically polarized, **(A)342**
  for citizens' band, **2456**
  for cm waves, **(A)31**
  coupled, theory of, **2450**
  current distribution in, **1558**
  cylindrical, with gap, **3026**
  dielectric losses of, **1274**
  dielectric rod, **3349, 3350**
  diffraction, circular, theory of, **1858**
    radiation and resistance of, **1269**
  dipole, λ/2, with tuned reflector, field of, **3027**
    field near horizon, **224, 1443**
    radiation impedance of, **(A) 1280**
  directive, basic design principles for, **2466**
    broadcasting, effect of circulating currents on efficiency, **(A)2443**
    comb, **2169**
    contour plotter for, **1864**
    design of, **958**
    effect of flanges on radiation patterns of small horns, **2468**
    high gain, for 144 Mc/s, **345**
    physical limitations of, **(A)2443**
    radiation patterns of, **3353**
    receiving, **2175**
  e.m. radiation formula for, **340**
  end-fire arrays, **1271**
  feeders for, efficiency at u.h.f., **349**, measurement of parameters, **1677**
  f.m., with circular polarization, **(A)2443**
    design theory, **955**
    radiation patterns by means of models, **2463**
  for f.m. receivers, **(A)237**
  gain and polar diagrams, **1861, (D)2461**
  ground-plane, design of, **1262**
  horn, with medium-sized aperture, **2453**
  inductive coupling of, **953, 2733**
  invention of, **(D)1218, 1219**
  loop, **3354**
    circular, with non-uniform current distribution, **34**
    coupling transformers for, **354**
    receiving, current calculation, **33**
  maximum directivity of, **2731, (D)3031**
  microwave, **2459**
    analysis of, **656**
    measurements on, **1281**
    parabolic, design of, **657**
    polar diagram plotter for, **32**
    power gain of, **3352**
    theory of linear arrays, **2452**
  mutual impedance of, **658, 2174**
  omnidirectional, high-gain, for circularly polarized radiation, **(A)2443**
    R.C.A. pylon, **2454**
    stacked-V, **2170**
    for 50 Mc/s, **655**
  open, partially-screened, **(D)659**
  optimum current distribution in, **2730**
  parabolic, feed systems for, **657**
  paraboloid, design of, **2448**
    waveguide-fed, elimination of standing waves, **2469**
  parasitic, tuning of, **652**
  polar diagram of, automatic recorder for, **1400**
    with flat earth and screen, **2462**
    and gain, **1861, (D)2461**
    measurement, **32, 2727**, using models, **1276, 2463, 3353**
  polyrod, **652, 1859, 2449**
  radiation resistance of, **1862, 2451, 2729, 3030**
    in infinite array or waveguide, **(A)2443**
  receiving, induced voltage in, **1268**
    large, advantages of, **28**
    short, design of, **2726**
  reference, standard, **951**
  reflector, for wide angle scanning at cm λ, **(A)2443**
  and reflectors, coupling between, **1273**
  rhombic, **2464**
    design of, **1863**
  ring, radiation resistance of, **1862**
    resonant slot in waveguide, **3021**
  rotary, for 10 m and 20 m, **1277**
  series-loaded mast radiators, **3342**
  short, performance of, **651**
    in dielectric media, **3351**
    limitations of, **1261**
    radiation from, **3348**
  slot, **343, 1263, 1265, 3344**
    in corner reflectors, **2467**
    λ/2, centre-fed, field near, **3345**, input impedance of, **3346**
    omnidirectional, for cm λ, **957**
    with spindle-shaped radiation diagram, **1561**
    theory of, **1264, 1266**
  straight wire, polar diagrams for, **25**
  television, **(D) 958**
    all-wave, f.m., **1180**
    biconical, **839**
    close-spaced arrays, **(D)29**
    Farnsfield, **2093**
    WABD, **30**
    WTTG, **853**
    wide range, dual-band, **3347**
  theory of, **341**
    effect of finite gap, **24**
    use of Fourier transforms, **155, 1069, 2270, 3159**
  thin, reactance of, **346**
  top-loaded, **1278**
  tower, for broadcasting, **26**
  transmitting and receiving properties of, **3023**
  vertical, impedance over finite ground planes, **(A)2443**
    λ/4, impedance of, **2173**
    mutual impedance of, **658**
  v.h.f., for naval communications, **3341**
    for short-distance communication, **3340**
    vertically polarized, **1279**
  wide-band, helical-beam, **(A)2443**
  Yagi, for 600 Mc/s, **2458**
Alloys (See also Ferromagnetic materials; Magnetic materials; and individual substances)
  binary, ferromagnetism of, **1974**
  Cr-Fe, passivity in, **744**
  Cu-Ni, **1064**
  electrical and physical properties of, **3150**
  ferromagnetic, temperature changes during magnetization of, **2804**
  Mn-Sb, resistance variation of, **2830**
  Ni-Fe, magnetic anisotropy in, **3428**
  permanent-magnet, data for, **1663**
Alternators, inductor, h.f., **1172**
Ammeters, a.c., polar, **1084**
Ammonia See Absorption, microwave, of NH_3
Amplidyne, **3527**
Amplification, constant, **2752**
  current, by diamond, **2757**
  h.f., **688**
  l.f., medium-power, **1321**
  video, wide-band, **581**
  voltage, formulae for, **2495**
Amplifiers (See also Cathode followers; Radar; Television apparatus)
  a.f., **87**
    B.B.C., **992**
    converted ART/13, **1319**
    for electro-encephalograph, **680, (D)1128**
    flexible design, **1317**
    high-fidelity, **696, 2206**
    high-gain, **3376**, low-noise, **2760**
    level-governing, **68**
    power, **1318**
    testing by square waves, **1081**
    for use with noise suppressor, **2759**
    with variable selectivity, **1596**
    120-W, for speech, **56**
  with a.g.c. and limiter, **69**
  band-pass, design of, **(CD)1315, 2493, 3064**
    design and analysis of, **(D)3064**
  bridge-balanced, for valve voltmeters, **2494**
  cathode, **1887**
  cathode-coupled, **(D)1322**
    triode, charts for, **995**
  circuits, gain and noise figures at v.h.f. and u.h.f., **1599**
  class C, theory of, **1313**
  common cathode, **2490**
  compensated, square wave analysis of, **(A)2552**
  for counters, **3066**
  d.c., with a.c. feed, **1324**
    with automatic zero adjustment, **1602**
    electromechanical, **663**
    using electrometer valves, **3177**
    high gain, **380**
    sensitive, **(A)694**
    for signals ~ 1μV, **381**
    for valve voltmeter, **3178**
  feedback, **(A)382, 1326**
    with controlled input reactance, **(A)2475**
    design of, **(B)3381**
    for magnetic pickups, **1608**
    negative, improvements in, **3377**, theory of, **383, 1329**
    video, analysis of, **2766**
  graphical analysis for, **374**
  harmonic, design of, **61, (D)1888**
  high-quality, design of, **1328**
  i.f., flat response, single tuned, **2496**
    for f.m. receivers, **527**
    design for radar, **690**
    l.f. compensation for, **1601**
  l.f., portable, **377**
  linear, **991**
  load impedance reduction for, **3063**
  low-noise, cascode, **(A)2475, 3061**
  magnetic, **198, 664, 1566, 1567, 1869, 3359**
    design of, **1285**
    materials for cores, **(A)3431**
    neutral type, **960, 2179**
    use in calculating machines, **159**
  multi-stage, transients in, **1597**

  noise at u.h.f., **3067**
  N-stage, response of, **3062**
  oscilloscope, direct-coupled, (**A**)**65**
    distortion-free, **1595**
    wide-band, **64**
  packaged, using subminiature valves, **2207**
  peak-limiting, dynamic performance of, **689**
  power, a.f., **1318**
    cathode followers in, **3060**
    class-C, transit-time effects in, (**A**)**2475**
    quadriline, f.m., **70**, **598**, **691**
    wide-band, **2754**
  pulse, wide-band, delay-line-coupled, (**A**)**2209**
  pulse and television, performance criteria for, (**A**)**373**
  push-pull, balance in, **997**
    class-A, theory of, **1891**
  response-compensated, **2214**
  r.f., double-tuned, **1314**
    linear, high-power, **989**
    multichannel, **2213**
  shunted, input admittance of, **2758**
  stagger-tuned, design of, **2491**
  travelling-wave, delay-line-coupled, theory of, (**A**)**2475**
    v.h.f., **66**
  triode, cathode-coupled, charts for, **995**
  u.h.f., theory of, **379**
    use of v.m. valves for, **1890**
  with variable bandwidth, **60**
  video, transient response of, (**A**)**2475**
  wide-band, (**A**)**378**
    design of, **1889**, **2753**
    with distributed amplification, (**A**)**2475**, **3375**
    power, **2754**
    for 550 Mc/s, **692**
  for wire recorder, **2155**
  6AS7G, general-purpose, **2756**, high quality, **2755**
  using 6L6G, **2202**
Analogies, electromechanical, **1865**
    and electroacoustical, (**B**)**2159**
Analysers, electronic, for aircraft engines, **2310**
  heterodyne, with polyphase search voltage, **2013**
  l.f., **1403**
  network, a.c., **961**
    for study of e.m. fields, (**A**)**2475**
  panoramic, for receiver alignment, **1096**
  spectrum, r.f., wide-range double-heterodyne, **769**
Analytical signal, theory and applications of, **1293**
Astronomy, recent developments in, **2227**
Atmosphere (See also Sound propagation; Wave propagation, e.m.)
  conductivity of, principles of measurement of, **2556**
  with frequency-dependent absorption, **1638**
  lower, ionic equilibrium of, **2792**
    reflections from, (**D**)**722**
    refractive index measurement, errors in, **1941**
    transmission curve at 1–5μ, **3098**
    wind distribution in, **1033**
    zonal currents outside the tropics, **3120**
  standard, radio, **2045**
  tidal motions in, resonance theory of, **1938**
  upper, distribution of O and O_2, **418**
    excitation conditions in, **1359**
    research with V-2 rockets, **1427**
    twilight observations of, **3114**
Atmospheric electricity (See also Ceraunometer; Clouds; Electrostatic field; Lightning; Potential gradient; Thunderstorms)
  discharge currents in balloon cables, **1034**
Atmospherics, direction finder for, **3122**
  directional observations at sunset, **1363**
  fine structure of, **2519**, **2520**
  origin of certain types of, **2521**
  range corresponding to recorder threshold, **3504**
  tail component, propagation of, **2888**
Atomic energy, health problems, (**A**)**2677**
Attenuation, acoustic, in multiple partitions, (**A**) **2141**
  anomalous, in waveguides, **2446**
  of cm waves by rain etc., **2062**, **2332**
  of 200-Mc/s signals by rocks, **3476**
  standard, microwave, (**A**)**2443**
Attenuators, cavity, theory and design of, **2762**
  for waveguides, **1892**
Audience-measurement, radio, instantaneous, (**A**)**2430**
Aurora australis, notes on, **1953**
  and ionosphere perturbations, **421**
  and ionospheric layer, **2243**
  and night-sky light, **730**
  proposed index figure for, **1952**
  radio echoes from, **422**, **2244**
  research at College, Alaska, (**B**)**2796**
  in Southern Siberia, **2245**
Automatic control See Servomechanisms

B

Barium titanate, [illegible]
  ceramics, 3139
  crystals, (**A**)**125**, growth of, **2810**, dielectric constant and piezoelectric resonance of, **2540**
  dielectric constant, at low temperature, **1382**, of porous samples, **2262**
  dielectric properties, **127**, at h.f., **1660**
  electrostriction in, **1062**
Batteries, dry, recent developments in, **1769**
    Ruben-Mallory Hg cell, **2645**
    shelf life of, **2933**
  Leclanché, recent improvements, **1171**
  Pb/acid, effect of climatic extremes, **2932**
Beacons See Navigation aids
Bearings, jewel, instrument, contact conditions for, **410**
Betatrons See Particle accelerators
Bibliographies, technical, sources of, **3280**
Bipoles, theory of, **2190**
Blind, guidance by supersonics, (**A**)**2573**
Bolometers, evaporated-Ni, **194**
  for cm-λ power measurement, **2025**
  microwave, d.c. characteristics of, **2862**
Book notices and reviews
  Almanach des Sciences, **2674**, (**C**)**3571**
  Applied Bessel Functions, **2275**
  Applied Mathematics for Engineers and Physicists, **1394**
  Auroral Research at College, Alaska, **2795**
  British International Plastics Annual, 1947, **1665**
  British Research in the Radio Field, **320**
  British Sources of Reference and Information, **3284**
  British Standard 204: 1943. Supplement No. 1, Glossary of Terms used in Waveguide Technique, **3356**
  British Standards Institution Yearbook, 1947 edn, **1528**
  Calculating Machines—Recent and Prospective Developments, **464**
  Crystal Rectifiers, **2989**
  Daten, Kennlinien und Schaltungen der deutschen Rundfunkröhren und ausführliche Anwendungsbeispiele, **3569**
  Description of the Earth's Main Magnetic Field and Its Secular Change, 1905–1945, **1645**
  Electromechanical and Electroacoustical Analogies and Their Use in Computations and Diagrams of Oscillating Systems, **2159**
  Electronic Circuits and Tubes, **2228**
  Electronic Developments, **222**
  Electronic Engineering Master Index 1946, **1220**
  Electronic Engineering Patent Index 1946, **1221**
  Electronic Engineering Principles, **907**
  Electronic Transformers and Circuits, **2221**
  Electronics, **799**
  Elementary Manual of Radio Propagation, **3498**
  Elements of Acoustical Engineering, **1548**
  Fluorescence et Phosphorescence, **453**
  Fourier Transforms and Structure Factors, **2289**
  Frequency Modulation, **2067**
  Frequency Modulation Engineering, **558**
  F.M. Simplified, **2638**
  F.M. Transmission and Reception, **3526**
  The Fundamental Research Problems of Telecommunications, **2995**
  Fundamentals of Radar, **2533**
  Fundamentals of Radio, **1222**
  Further Studies in Magnetophones and Tapes, **2160**
  Guide to Broadcasting Stations, **626**
  Hearing Aids, **2714**
  High-Frequency Measuring Techniques using Transmission Lines, **2030**
  Industrial Research 1947, **1527**
  Introduction to Wireless, **2681**
  Ionospheric Research at College, Alaska, **2796**
  Kettenförmige Ultrakurzwellen-Bandfilter aus Quasistationären Schwingtöpfen, **697**
  Klystrons and Microwave Triodes, **3570**
  Klystron Tubes, **617**
  Letter Symbols for Electronic Valves, **869**
  Loudspeakers: The Why and How of Good Reproduction, **3333**
  A Manual of Vacuum Practice, **3157**
  Mathematics for Radio Engineers, **2274**
  The Mathematical Tables Project, **162**
  Matrix and Tensor Calculus, **1395**
  Microwave Transmission Design Data, **3545**
  Micro-Waves and Wave Guides, **1564**
  Microwave Mixers, **2809**
  Microwave Technique, **2683**
  Modern Electrical Engineering Mathematics, **161**
  Most-Often-Needed F.M. and Television Servicing Information, **3076**
  Most-Often-Needed 1947 Radio Diagrams and Servicing Information, [illegible]
  Network Analysis and Feedback Amplifier Design, **3381**
  New Developments in Ferromagnetic Materials, **3447**
  Nomograms of Complex Hyperbolic Functions, **1986**
  Philips Manual of Radio Practice for Servicemen, **2075**
  Photographic Recording of Cathode-Ray Tube Traces, **2382**.
  Plastics for Electrical and Radio Engineers, **1066**
  Principles and Practice of Wave Guides, **350**
  Principles of Quantum Mechanics, **1917**
  Principles of Radar, **3419**
  Radar Aids to Navigation, **2255**
  Radar Beacons, **3418**
  Radar Engineering, **118**
  Radar System Engineering, **435**
  Radio Aids to Navigation, **1048**
  Radio Data Charts, **3285**
  Radio Engineering, **2996**
  Radio-Frequency Heating, **221**
  Radio Handbook, **2680**
  Radio Research Special Report No. 15: Radio Noise, **534**
  Radio Research Special Report No. 17: Fundamental Principles of Ionospheric Transmission, **3226**
  Radio-Technik, Theorie und Praxis, **1530**
  R.C.A. Technical Papers, **1844**
  Servo Mechanism Fundamentals, **1177**
  Sunspots in Action, **1954**
  Tabellen zur Laplace Transformation und Anleitung zum Gebrauch, **3450**
  Tables of the Bessel Functions of the First Kind, **463**, **1396**.
  Technical Dictionary, **906**
  Techniques of Microwave Measurements, **2865**
  Television Techniques, **584**
  Television To-day, **1195**
  Test Gear for Frequency Modulation and Television, **3194**
  Theorie der Supraleitung, **2509**
  Theory and Application of Microwaves, **2682**
  Theory and Applications of Mathieu Functions, **1397**
  Theory of Mathematical Machines, **1074**
  Über Synchronisierung von Röhrengeneratoren durch Modulierte Signale, **2503**
  Ultra- and Extreme-Short Wave Reception, **2074**
  Ultrahigh Frequency Transmission and Radiation, **1283**
  Vacuum Tubes, **3279**
  Very High-Frequency Techniques, **2117**
  Visible Speech, **2713**
  Wireless Direction Finding, **1047**

Boundary problems, in mathematical physics, **1392**; Schwarz' inequality, **1069**; in sound transmission, **911**

Breakdown (See also Dielectrics; Insulators; Insulating materials)
  of gases, at h.f., **3085**
    at microwave frequencies, **3390**
—— **strength**, of air, at cm λ, **750**, (**D**)**3436**
    at u.h.f., **2818**, **3141**
  of compressed gases, **2824**
  of polythene, **2287**

Bridges (See also Capacitance; Impedance; Measurement)
  a.c., theory of Wagner earth for, **2853**, vector principles of, **2288**, Wheatstone, **3180**
  capacitance, direct-reading, **168**, with rectifier and galvanometer, **3181**
  conductance-unbalance, **2562**
  d.c., with nonlinear resistances, **1570**
  feeder, transmission-line, **2854**
  h.f., **1410**
  impedance, microwave, (**A**)**2552**, sensitivity of, **2010**, for 20–140 Mc/s, (**A**)**181**
  inductive, **1289**
  Maxwell, for periods 1–200 sec, (**A**)**182**
  r.f., for broadcast stations, **2563**
  Schering, Type D-98-A, **3482**, wide-frequency-range, for capacitance, **180**
  unbalanced, for process control, **668**
  use of c.r.o. as indicator, **2011**
  waveguide, for gain measurement at 4000 Mc/s, (**A**)**2553**

Broadcasting (See also Aerials; Communication systems; Modulation; Relay systems; Studios)
  arrangements for the royal wedding, **2082**
  in Australia, **1760**
  f.m., chain, **820**
    and circular polarization, **227**
    for Italy, **1759**
    u.s.w., **2893**
  frequency response of short telephone lines, **650**
  jubilee of, **1525**
  on l.v. distribution network, **2613**
  provision of services, **2637**
  in U.S.S.R., **535**
  war-time activities of B.B.C. Engineering Division, **2086**, (**D**)**3525**
—— **equipment**, monitor, **1509**
    a.f., **3190**
    f.m., **488**, **2861**
  sound-distribution system for hotels etc., **327**
  6-channel multiplex, **541**

—— **networks**, synchronization of, **269**
—— **stations** (See also Transmitters)
  a.m., at Omaha, **267**
  control room design, **3522**
  f.m., planning of, **822**
    at Syracuse University, **554**
    in U.S.A., **824**
    1-kW, **269**
  guide to, (**B**)**626**
  at Skelton, Cumberland, **3521**
  speech-input equipment, at Brussels, **2923**, at Oslo, **3008**
  s.w., at Allouis (France), **553**, **2922**
  transmitter buildings for, **823**
—— **systems**, a.m. *vs* f.m., **261**
  h.f., Hifam, **3523**
  u.h.f., multiplex, (**A**)**540**
  world-wide plan for United Nations, **557**

C

Cables, Al-sheathed, **1985**
  characteristic impedance of junctions, **2717**
  coaxial, electrical constants of, **331**
    impedance irregularities of, **2162**
    propagation of signals in, **2161**
    series reactance in, **1854**
    tapered junctions for, **948**
  constants of, measurement at 3000 Mc/s, **1997**
  h.f., design of, **1550**
  lead-cased, protection by rubber jacket, **3015**
  polythene, voltage characteristics of, (**D**)**2841**
  pulse-echo measurements on, **2296**
  r.f., heating of, **3014**
  twin, screened, propagation constants of, **1689**
Calculating machines, alteration of digital data in magnetic-drum memory, (**A**)**2548**, analogue, **157**, **458**, d.c., **2549**, REAC, **3161**, and digital, **757**
  computers, digital, large-scale, design of, (**A**)**2546**
    electrical, bridge-type, **1072**
  d.c. electronic integrator design, **2551**
  developments, (**B**)**464**
  digital, selective sequence, **2550**
  EDSAC, ultrasonic memory unit for, **3448**
  ENIAC, computing circuits of, **158**, valve failures in, **601**
  for integrating differential equations, **1667**
  resistor network for Laplace's equation, **1071**
  for simultaneous and characteristic equations, **2834**
  theory of, (**B**)**1074**
  Univac, (**A**)**2548**, (**A**)**3160**
  use of magnetic amplifiers in, **159**
  use for network problems, **160**
Cameras (See also Television apparatus)
  for c.r.o., **2931**
Capacitance measurement, connection errors in, **169**
    at National Physical Laboratory, **2863**
    for small variations at a.f., **1078**
    with Schering bridge, **180**
    sensitive, **2000**
  meter, with neon-lamp indicator, **3182**
    with quartz resonance indicator, (**A**)**2289**
Capacitors, by-pass, effectiveness at v.h.f., **2473**
  d.c., watt-second rating, **42**
  duct, for interference suppressors, **2474**
  paper, containing chlorinated impregnants, **965**
  power, manufacture of, **964**
  vitreous-dielectric, printed, (**A**)**1614**
Carbonates, of Ba and Sr, mixtures of, **1654**
Carrier-current systems (See also Communication systems)
  coaxial cable, terminal equipment for, **1153**
  power-line connections for, **2355**
  rural, **2612**
    common terminal equipment for, **2611**
    power-line treatment for, **2355**
    subscriber terminal for, **1490**
  SOJ-12 open-wire telephone, **2610**
  12-channel, S12-102, **1489**
  48-channel, **2356**
Cathode followers (See also Amplifiers)
  circle diagrams for, **2210**
  gain chart for, **63**
  operating conditions for, **1316**
Cathode-ray oscillographs, high-speed, **1690**
  multi-gun, **3184**
  for precision time measurement, (**A**)**2552**
  with push-pull amplifiers, **2014**
  recording systems for, **770**, **1411**, **1412**
  use for transmitter adjustment, **2290**
  with 5-inch tube, **2565**
—— **oscilloscopes**, camera for, **2931**
  h.f., **2566**
  measurement of tracing speed, **3185**
  monitoring, **2567**
  from Service-surplus radar display units, **2564**
  timebase circuits for, **685**
  use in receiver testing, **1089**
  for valve characteristics, **772**
  for very low frequencies, **1088**
—— **screens**, **1212**
  actinic properties of, **886**
  characteristics of, **884**
  long-persistence, **1653**, testing of, **1652**
  for radar, **885**
  white, for television, and I.C.I. colour system, **570**
—— **tubes**, barrier-grid, for image storage, **2986**
  chromoscope, for colour television, **2937**, **3531**
  design of, **2416**
  image-storage, (**A**)**2983**
  improvements in construction, **2669**
  iron-core deflecting coils for, **2498**
  magnetic-deflection circuits for, **574**
  memory, **319**
  negative-ion blemish in, (**A**)**2663**
  numeroscope, **1574**
  photographic recording of traces, (**B**)**2382**
  for radar, (**D**)**887**, **888**, visibility of signals, **889**, **2985**
  R.C.A. Type 5W (P15), for television scanning, **3563**
  Service-surplus, characteristics of, **1835**, **3561**
  skiatron, **1838**, for radar displays, **888**
  stereoscopic viewing for, **2984**
  storage, repeller, **3560**
  for X-ray image intensification, **3562**
Cathodes, European manufacturing methods, (**A**)**2663**
  oxide (See also Electron emission)
    characteristics under pulse conditions, **2414**
    effect of degassing procedure, **2415**
    electrical properties of interface, (**A**)**315**
    emission from, **1826**, (**A**)**2104**, **2974**, effect of light, **607**
    emission-measurement apparatus, **1095**
    energy levels in, **1981**
    rectification characteristics of interface, (**A**)**314**
    secondary emission from, **3551**
    spectral emissive power of, **1010**, **2973**
    temperature measurement of, **1010**
    theory of, **606**, and properties of, **1894**
  Sb-Cs, **3560**
  semiconducting, emission from, **1823**
  thoriated, properties of, **141**
Ceramics, $BaTiO_3$, **3139**
    piezoelectric effect in, **741**
  $BaTiO_3/SrTiO_3$, properties of, **446**
  for capacitors, **146**
  German, survey of, **454**
  and glass, properties of, **3142**
  low-temperature-coefficient, **455**
  metal, [illegible]
  porcelain, with low expansion and dielectric loss, (**A**) **445**
  properties and uses of, **1391**
  semiconducting, **752**
Ceraunometer, lightning discharge recorder, **2794**
Charts, for attenuation in Zobel filters, **1334**
  for cathode-coupled triode amplifiers, **995**
  for choke calculations, **1290**
  data, radio, (**B**)**3285**
  design, for single-layer coils, **963**
  impedance, for parallel resonant circuits, **1876**
  for transmission line mismatch loss, **1557**
Chokes, charts for calculation of, **1290**; minimum-cost, design of, **2183**
Circle diagrams, of impedance or admittance for quadripoles, (**A**)**3357**
  for transmission-line calculations, **337**, **1250**
Circuit analysis, for linear systems, **3046**
  nodal method of, (**D**)**671**
—— **breaker**, electronic, **279**

  for instrument protection, 1763
—— **symbols**, shorthand notation for, (D)43, Services recommendations for, 2737
—— **techniques**, for radar, 1874
—— **theory** (See also Mathematics; Networks; Nonlinear problems; Transients)
  diode as converter or detector, 3360
  interaction of two oscillators, 361
  intermodulation products, 2188
  reactance-valve circuit analysis, (A)2475
  for resistor-transmission-line circuits, 1871
Circuits (See also Filters; Networks)
  amplifier and oscillator, triode, v.h.f., 3039
  anode-follower, 990
  anticoincidence and recording, 1706
  a.v.c., adjustment speed of, 3074
  band-modulator, applications of, 1730
  band-stopper, crystal, 3071
  cathode-coupled negative-resistance, 3372
  cathode-follower, 994
    gate, 2206
    linear theory of, 1593
    in power amplifiers, 3060
  cathodyne-dephasing, 58
  coincidence, with high resolving power, 2471
  compression, negative-feedback, 2158
  counter, for television synchronization, 2472
  coupling, graphs for attenuation in, 1323, RC, simple theory, 1303
  delay, phantastron, 2478
  electronic, and valves, 359, (B)2222
  equalizing, RC, simplified design of, 2742
  equivalent, for bend in waveguide, 648
  feedback, simple formulae for, 1327
  f.m., detector, 988, fremodyne, 1731
  frequency-counting, as f.m. detectors, 3235
  graphical calculation of, 972
  hybrid, for microwaves, 678
  input, differential, 1594, push-pull, 1325, 2211, 2212
  limiter, and frequency detectors, (A)237
  Miller, integrator, 1297
  mixer, microwave, (B)2609
  negative-feedback, 1606
  negative-resistance, for Q multiplication, (A)2475
  nonlinear, stability conditions in, 1575
  oscillatory, coupled, theory of, 364, 365, 1302
    crystal, pulsed, 973
    frequency stability of, 1581
    with nonlinear self-inductance, 362
    resonance voltage of, 3045
    superheterodyne, abacs for, 1473
    u.h.f., wide-range, 3373
  with periodic parameters, equivalents for, 959
  phase-equalization, 1873
  phase-splitting, high-gain, 1603
  printed, applications of, (A)1614
    E.C.M.E., (A)238
    military requirements for, (A)1614
    for receivers, (A)1614
    techniques for, 1894
  pulse, characteristics of, 3057
  reactance-modulator, theory of, 1589
  receiver-input, low-noise, (A)2596
  resonant, parallel, impedance diagrams for, 1876
    tunable, for 300–3000 Mc/s, 3370
    variable, theory of, 1875
  response to sawtooth e.m.f., 1872
  r.f., i.f. and a.f.c., (A)237
  special, the Photoformer, (A)2475
  square-law, 670
  superregenerative, applications of, 1591
  thermal compensation of, 3041
  trigger, photocell-operated, 1572, rheostat, 1870
  triode, matrix equations for, 3043
  tuned, n-meshed, resonant frequencies of, (D)681
  tuning, 996
  twin-T and bridged-T, 1576
  u.h.f., 1288
  valve, oscillating, 1585
Classification system, Universal Decimal, 1521
Climatology, radio, 1943
Clocks, synchronous control by crystal oscillator, 761
Clouds, cumulus, electric field in, 1361
Coils, deflecting, iron-core, for c.r. tubes, 2498
  finishes for, temperature-coefficient effects of, 1610
  progressive and universal, design of, 1832
  resonant-line, for 28 Mc/s, 72
  short-circuited turns in, 3379, detection of, 3378
  single-layer, design of, 963
  s.w., band-spread, design of, 3069
Communication engineering, f.m., (B)558
  h.f., and remote control, 3283
  reconstruction of Leafield masts, 565
—— **equipment**, Army wireless set No. 10, 2624
  in British Navy, 2084
  microwave, 8-channel, 2918
  mobile, f.m., 274, 558
    ph.m., for 152–162 Mc/s, 2361
    Admiralty Type-612, 2360
  on South African railways, for royal tour, 2369
  v.h.f., for aircraft, 3251
—— **systems** (See also Broadcasting; Carrier-current systems; Infra-red; Radio links; Radiotelegraphy; Radiotelephony; Relay systems)
  for aircraft, 2085, (D)2633, 118–132 Mc/s, 828, telecontrol of receivers, 275, 2636
  aircraft/ground, 426, (D)1638
  bandwidth reduction in, (A)2614
  used by British South American Airways, 1501
  carrier (f.m.), short-range, 1152, for power lines, 819
  cm-wave, early developments, 286
  combined f.m./a.m., (A)2614
    2-channel, 1494
  cross-channel, on 93 Mc/s, 3497
  crystal-controlled, v.h.f., asac, 2616, (D)3509
  emergency, in mines, 2367, 3517
  high-altitude stations and links, 546, 2632
  infra-red, 2908
  light-beam, principles of, 2909, concentrated-arc lamp for, 585
  long-distance, point-to-point, for radiotelegraphy and R/T, 2077, 2368
  in merchant marine, 2926
  microwave, 549, duplex, 3247, multiplex, using waveguide, 257, (A)2078, portable, 2200–2400 Mc/s, 2914, repeater research for, 2918, R/T, (A)542
  military, 2083, (D)2633
  mobile, 826, 827, a.m., for police, 1163, f.m., R/T, 1165, ph.m., duplex, 273, v.h.f., R/T, 262, 273
  for moving trains, 555, 1164
  multichannel carrier, 3245, using pulse-phase modulation, 2625, for Middle East oil pipeline, 2368, 2631
  multiplex, p.m., 2359, pulse, 3507, pulse-time-modulated, 548, theoretical analysis of, 3246
  ph.m. and f.m., ratio of frequency swing to phase shift, (A)2430
  pulse, 2078, (D)2818, duplex, common-wave, 2535, high-power cm-λ, 2627, on lines, 2816, noise in, 2805, 2806
  using pulse-count modulation, signal/noise ratio, (A)2614
  radio, in Angola, 2628, trends in, 2115
  radio vs cable, (D)817
  using reflected power, (A)2614
  selective sideband, (A)2614
  for South African railways, (D)2925
  speech intelligibility in, 323
  theory of, (AD)1745
  transients in, 1746
  two-phase, 2912
  u.h.f., mobile and fixed, 2081, (D)3514
  v.h.f., point-to-point, 2080, (D)3515, use of common aerials for, 3580
  for water works, 1751
Comparator, for testing hardness and composition, 1111
Compasses, radio, British, 423, at Radlett aerodrome exhibition, 1636
Components, developments in America, Great Britain and France, 1340
  future design trends, 625
  miniature, 1002, 1339
  Paris 1948 Exhibition, 3075
  printed, vitreous-enamel, 1003
  radio industry's activities, 1895
  for receivers, testing of, 2864
  standard tests for, 1899
  war-time development of, 1900
Conductivity, electronic, of non-metals, 84
  of metals at u.h.f., 167, 1345, (D)2768
Conductivity meter, for h.f. loss measurement, 3461
Conductors, printed, on glass, (A)1614, physical properties of, (A)1614
Conferences and conventions, electron microscope, Leeds, 1947, 1713, 3208; F.C.C., television links, 298; I.E.E., scientific radio, 3282; I.E.E., servomechanisms, (A)829; I.E.E., radiocommunication, bibliography of supporting papers, 2112; International Telecommunications, Atlantic City, 1748, 1749, 2357; I.R.E. National, 1948, 2677; meteors, Manchester, 1947, 93; National Association of Broadcasters, 1947, 1504; oxide cathodes, London, June 1947, 2974; radio aids to marine navigation, New York and New London, April–May 1947, 2247; scientific information, Cambridge, 1214; U.R.S.I.–I.R.E., Washington, Oct. 1947, 2113; work of U.R.S.I. and C.C.I.R., 3281
Consoles, studio-control, C.B.S., 3241
Contact potential, in diodes, for negative bias, 353
  metal/semiconductor, 1381
—— **resistance**, silicon/metal, 2537
Contacts, atmospheric corrosion of, 3435
  effect of surface films on, 2769
  semiconductor, excess-defect, 443
Control, (See also Amplidyne; Frequency control; Servomechanisms; Telecontrol)
  automatic, of furnace temperature, 791, 1114
    in radar receivers, 808
    of ship's course, by magnetometer, 499
    theory of, 498, and radiophysics, 402
    of volume, as feedback problem, 2501
  crystal, multichannel, of superheterodyne receiver, 2342
  electronic, of a.c. motors, 784, of d.c. motors, (A)2574, 2580
  heater, in vacuum furnace, 2581
  process, by bridge unbalance, 668
  register, in printing, 789
—— **systems**, for transmitters, 849
Converters (See also Frequency converters)
  cathode-coupled, 240
  crystal-controlled, broad-band, 10-m, 1471
  for microwaves, 663
  power, vibratory, 277
  for use with R.1155 on λ 5–10 m, 1148
  weak signal, design for 28 Mc/s, 1485
Copper, and copper alloys, 1664
Cores, a. c. auxiliary magnetization of, 2507
  iron-alloy, h.f. properties of, 754
  magnetic, laminated, effects of overlapping joints, 1978
  powdered-iron, ring, permeability measurement, 471
Corona, correction on small bushings, (A)145, point-to-plane, (A)2286
Corrosion, of contacts by atmosphere, 3435
Cosmic noise, r.f., from constellation of Cygnus, 2514
  from galaxy, 95
    and D-layer ionization, 413
    at m λ, 1626
    at 60 Mc/s, 2515
    at 64 Mc/s, 1926
  from sky, at 3000 Mc/s, 721
  and telecommunications, 2777, 3102
  at 25 and 110 Mc/s, 2510
Cosmic rays (See also Mesons)
  bursts and showers, 416; effect of magnetic field of Milky Way, 100; effect of magnetic storm of 1st March 1941, 3113; latitude effect, 714; origin and properties of, 2787; solar effects, (A)109; 27-day period of, 716
Counters, decade-ring, 2184
  electronic, direct-reading indicators for, 2307, and frequency standards, 482, and sorting devices, (A)2574
  G-M, 2870
    adjustable, 2578
    analysis of impulses from, 1708
    with beaded wires, 494
    β-ray, for thickness measurement of sheet steel, 497
    characteristics and uses of, 2579
    CO_2-filled, 783
    coincidence counting with, 3199
    determination of dead- and recovery-time, (A)2574
    discharge characteristics of, (A)2308
    discharge-spread in, 1103
    experiments with, 2032
    He-filled, 3474
    measurement of efficiency, 496
    metal, design of, 1102
    photoelectric thresholds of, 1707
    recovery time of, 2309
    reduction of insensitive time in, 1425
    resolving power of, 1424
    resolving time and coincidence loss for, 2034
    rise of wire potential in, 196
    self-quenching, 3198, discharge mechanism in, 495, halogen-filled, 3197, photoelectric effect in, 2083
    short time delays in, 2576
  high-speed coincidence circuit, 1571
  nonsymmetrical, 2577
  n-scale, high-speed, 2186
  parallel-plate, 3200
  particle, electron-multiplier type, 1106
  photon, characteristic curves of, 1021
  photon and particle, 1423
  pulse, Model-200, 1105
  scale-of-10, 1705; scale-of-16, 2185; scale-of-100, 2306
  selective detector for charged particles, (A)2574
  statistical analysis of data, 462
  stepping, megacycle-rate, (A)2574, 3477
  use of diamonds, (A)2575
Couplers, directional, theory of, 675, for waveguides, 1855
Coupling, inductive, abac for efficiency, 974; of valves at u.h.f., 993
Crystallography, Fourier transforms and structure factors, (B)2369
Crystals (See also Piezoelectricity; Quartz)
  EDT, production of, 739
  filter, with low self-inductance, 388, 3072
  physical properties and symmetry of, 2811
  piezoelectric, determination of cuts by X rays, 144
  quartz, EDT and DKT, 3133
  rectifier, for variable time-constants, 371
Current distribution on aircraft structures, (A)2552
  and potential, significance at v.h.f., 3396
Currents, on conducting plane, due to parallel dipole, 1910
  direct, small, measurement of, 164, 1678
Cyclophon, beam-switching tube, 883, use for p.m., 1406
Cyclotrons See Particle accelerators

D

Delay lines, Hg, 673
    as computer memory, (A)2475
    theory of, 3367
  phase-corrected, (A)2475
  ultrasonic, 3479, solid, 1578
Demodulation, selective, (D)686, time, 807
Depth sounding, modern equipment for, 2127
Detection, static-free systems, (A)2596
  u.h.f., 1474
Detectors, crystal, and semiconductors, theory of, 87, Si, 3069
  f.m., 1475, (A)2475, 2343, fremodyne, 2065, 2339, (A)2596, using frequency-counting circuits, 3235
  frequency, (A)237
  ratio, 348, for a.m./f.m. reception, 2344, for f.m. receivers, 2346, improved, 1476
Diamonds, as amplifiers, 2757, as counters, (A)2575, 3399
Diathermy, s.w., apparatus for, 1408
Dictionary, technical, English-French-German, (B)906
Dielectric constant, of $BaTiO_3$ crystals, 2540
  of ceramics at cm λ, 2541
  and loss angle, measurement by plate method, 3169
  measurement, using cavity resonators, 173, 1995
    at cm λ, 1994
    for liquids, using special capacitor, 2554
    pulse methods, 1671
  of polar liquids at cm λ, 1991
  of solid dielectrics at cm λ, 1993
—— **loss**, 2821
  u.h.f., formulae for, 2344, measurement of, 765
—— **properties** (See also Insulating materials and cross references)
  of aqueous salt solution, 1915
  of $BaTiO_3$ crystals, 127
  of $BaTiO_3/SrTiO_3$ mixtures, 446
  h.f., measurement of, 172
  of ice, 1077
  of liquids for λ 9.4–50 cm, 1992
  of Rochelle-type crystals, 438
  of soil and water at cm λ, 2546
  of various liquids at h.f., 79
  of water and heavy water, 2508
  of water at cm λ, 1912, 1913, 1914
Dielectrics, ceramic, titanate, residual effects in, 2263
  rubber, accelerated aging tests, 3145
  solid, power factor and permittivity, 1060, temperature coefficient of, 1069
  synthetic, vacuum properties, (A)122, 3144
Differential analyser, electrical, 1070
  for plotting electron trajectories, 2408
Diffraction (See also Electromagnetic theory)
  at aperture in metal sheet, 3097
  by black screens, e.m. theory of, 3096
  and Huyghens' principle, 1618
  new formula for, 3095
  theory, singularities at sharp edges, 2772
  ultrasonic, by apertures and obstacles, 3297
Diffusion, of spherical waves in dispersive medium, 1617
Direction finders, for atmospherics, 3122
  H-Adcock, design of, 2528
  h.f., Marconi Type DFG28, 2796
  instant-reading, 2526
  for meteorological use, (A)2524
  spaced-collector, errors in, 424
  for storm location, 2527
—— **finding**, (B)1047
  aerial balancing and radiogoniometer design, 2246
  h.f., fundamental problems in, 1955
  naval, 1956
  stations in Angola, 2628
Directories, of scientific personnel and organizations, British, (B)1527, French, (B)2674, (C)3571
Discharge (See also Corona)
  arc, high-current, theory of, 3086, low-pressure, oscillations in, 1347, 1348
  electrical, through gases, 397
  gas, dynamic characteristics of probes, 3387
    h.f., starting potential of, 1906, theory of, 1902, 1903, 1904, 1905
    high-pressure, influence of cooling, 2226
    low-pressure, 398
  glow, Ne, with Mo cathode, 2770
    Hg-vapour, high-pressure, 399
    spark, mechanism of, 3388
—— **currents**, in kite-balloon cables, 1034
Discriminator, f.m., with adjustable bandwidth, 239
Dispersion, ferromagnetic, mechanism of, 1054
Displacement measurement, variable capacitor for, 200
Distortion, analysis, 2855
  bias-field, in magnetic tape recording, (A)2430
  delay, in microwave repeaters, 2859
  intermodulation, in disk recording and reproduction, 630, measurement with c.r.o., 947, meter for, 2858
  in light modulation by ultrasonic cell, 3000
  measurement, analysis of intermodulation method, 2553
  meter, 191
  network, of f.m. signals, 1294, 1886
  nonlinear, in low-frequency transformers, 3035, summation for, 2071
  in nonmetallic resistors, 3362
  phase, in audio systems, (A)2430, sensitivity of ear to, 1547
  phase and amplitude, in linear networks, 1901, (C)2764
  in pulse-code modulation, (A)2281
  in speech and music transmission, (AD)2149
  telegraph, B.B.C. measurement set, 2857
  of ultrasonic waves, 2999
Documentation, auxiliary publication of scientific papers, 2423
Doppler effect, formulae in ellipsoidal theory of special relativity, 2591, use for aircraft speed measurement, 782

E

Ear, degree of resonance of, 8; conducting material of, 2135; sensitivity to phase distortion, 1547; spiral of cochlea, (A)3311
Earth resistances, h.v. characteristics of, 1962
Earthing, of lightning conductors, h.f. testing, 688
  problems of, 2825
  and soil resistance, 1063
Eddy currents (See also Ferromagnetism)
  anomalous effects in sheet steels, 1977
  in ferromagnetic materials, 401
Elasticity, application of tensor analysis, 3083
Electrical effects of marine currents, 2788
—— **engineering**, in India, (A)1378, (A)1658, 2816
—— **systems**, transient behaviour of, 661
Electricity, frictional, 1620
Electrodynamics, interaction of electrons and e.m. field, 698
Electrolyte tank, for a.c. field distributions, 3459
  frequency transformations for, 2182
  for space-charge effect in valves, 3179
  for evaluating magnetic leakage, 2558
Electromagnetic field, interaction with electrons, 698
  of magnetic dipole and frame aerial, equivalence of, 1282
  of plane wave, 1351
  theory of, 3088
    and Kirchhoff-Huyghens principle, 1624
  of λ/2 dipole with tuned reflector, 3027
—— **theory** (See also Diffraction; Mathematics)
  diffraction phenomena, 1342
  of Faraday, and modern physics, 1343
  interaction of two particles, 223, 3213
Electromagnetism, classical equations of, 1002
  experimental basis of, 1909
Electron, history of discovery, (A)1011
  jubilee, (A)895
  self-accelerating, 703
—— **acceleration**, linear, multiple-gap, 207
  by resonant cavity, 1431
—— **accelerators** See Particle accelerators
—— **beams**, deflection of, 609
  divergence due to space charge, 1812
—— **emission**, effect of space charge, 372, (A)1825
  from metals covered by semiconductor, 3391
  from oxide cathodes, 1820
  secondary, 3392, from oxide cathodes, 3551, from solids, 89

—— **inertia,** and space-charge theory, **3393**
—— **lenses,** coaxial, **510**
  corrector system for, **1122**
  defects and image sharpness of, **1125**
  e.s., calculation of form aberrations, **1123**
    ellipticity aberration of, **2040**
    shape of field for, **2880**
  field plotting in electrolyte, **1436**
  magnetic, compound, spherical aberration of, **216**
    computation of, **2321**
    long, focal length formula, **2877**
  measurement of axial magnetic field, **511**
  space-charge, for focusing ion beams, **215**
—— **microscope,** e.m., resolving power of, **2323**
  e.s., C.S.F., **212, 3209**
  experimental, **2322, 2879**
  Leeds conference, 1947, **1713, 3208**
  Metropolitan Vickers, Type EM2, **(A)211, 2041**
    Type EM3, 100-kV, **2878**
  new principle, **3210**
  resolving power and objective defects, **214**
  survey, **1433**
  use of diaphragms in, **1435**
  with variable magnification, **213**
  for 400 kV, **2039**
—— **mirrors,** calculation of, **1013**
—— **motion,** automatic tracing of, **2009**
  between constant-potential electrodes, **1012**
  focusing by e.s. and e.m. fields, **81**
  between parallel grids, **2407**
  between plane inclined pole-faces, **409**
  and space charge effects, **1811**
  tracing by differential analyser, **2408**
  in uniform magnetic field, **709**
—— **multipliers,** with large effective cathode surface, **2975**
  magnetic, **796**
  photoelectric, with Sb-Cs cathode, **2100**
—— **optics, 3484,** of electron guns, **1126, 3558**
—— **reflectors,** design of, **82**
—— **sources,** cold-cathode, **(A)1434**
—— **telescope,** for stellar photometry, **1714**
—— **waves,** polarization of, **391**
Electronic applications, aeronautical research, **204;** in astronomy, **3478;** automatic temperature control, **791;** balancing of gyroscope rotors, **203;** case hardening, **1117;** c.r. recording micrometer, **786;** crack detection by X rays and γ rays, **2305;** diathermy, s.w., apparatus for, **1108;** dielectric heating, **2036,** of woodwork, **505;** h.f. inductive heating, **1116;** in industry, **1110,** apparatus design, **2313;** insulation thickness measurement, **788;** leak detection in pressure systems, **2303, 2866;** measurement of aircraft speed, **1703,** by Doppler effect, **782;** micrometer, **1129;** photoflash unit, **1430;** preservation of food, **2325;** pressure measurement for explosions, **787;** printing control, **789;** proximity fuse, **219;** rate measurement for watches, **1669;** r.f. heating, **1429;** testing of camera shutters, **3479;** therapy with the electroshock, **3201;** u.h.f. heating of frozen food, **504**
—— **engineering,** master index for 1946, **(B)1220**
  patent index for 1946, **(B)1221**
  principles of, **(B)907**
Electronics, (B)799
  circuits and valves in, **359**
  survey of development, **(B)222**
Electrostatic field, on aircraft, meter for, **2287**
  in cumulus clouds, **1361**
  of point charge inside cylinder, **78**
Electrostatics, effects in aircraft, **530, (D)812**
  experimental basis of, **1909**
Electrostriction, in $BaTiO_3$, **1062**
Engineering See individual subjects
Entertainment systems, on trains, **270**
Enthrakometer, for waveguide power measurement, **2020**
Equalizers, shunt, design of, **2480**
Exhibitions, amateur radio, 1946, **1523;** components, Paris 1948, **1897, 1898, 3075;** electronics, Manchester 1947, **619;** Paris fair 1948, **3231, 3572, 3573;** Physical Society 1947, electrical and acoustical instruments, **179;** Physical Society 1948, **2283;** radio, Olympia 1947, **524, 618, 1216;** R.C.M.F., **1896, 2218;** Radlett aerodrome, radio compasses and communication equipment, **1036**

F

Facsimile, equipment for service between London and antipodes, **2383**
  in four colours, **567**
  photocell for, **2961**
  scrambled, for secret message transmission, **271**
  standards for, **1772**
  transmitter at Miami Herald, Florida, **2648**
  in U.S.A., **289, (A)1178**
  v.h.f. mobile equipment for, **290**
Fading machine, 2299
Fault location, in cables, by pulse technique, **2842**
  in h.v. transmission lines by radio methods, **2539**
Feedback, negative, in amplifiers, **1605**
    theory and applications of, **1604**
Ferromagnetic materials (See also Alloys; Magnetic materials)
  in alternating fields, **3430**
  Caslox, **133**
  coercive field of Fe and Fe-Co powders, **134**
  eddy currents in, **401**
  high-coercivity, **1053**
  loss measurement for small samples, **178**
  new developments in, **(B)3447**
  thermomechanical treatment of, **1052**
Ferromagnetism, [illegible]
  Barkhausen discontinuities, **3091**
  of binary alloys, **1974**
Field strength, of λ/2 aerial above plane earth, **3024, 3025**
  measurement, technique and apparatus for cm λ, **2028**
    thermometric, for cm λ, **491**
    for 465-Mc/s equipment, **1728**
    at 400–4000 Mc/s, **1685**
  meter, for cm λ, **2029**
  pulse and c.w., measuring set for v.h.f., **1684**
  range data, for radar set, **(D)432**
  recording, of sky-wave signals, **778**
Filaments, thoriated tungsten, design of, **1655**
Films (See also Sound recording ; Sound reproduction)
  adsorbed, Fe, on Cr, **744**
  dielectric, thin, auto-electron emission from, **88**
  metal, for resistors and printed circuits, **(A)1614**
  oxide, formation on metals, **439,** on Mo, **742,** on W, **743**
  PbSe, conductivity of, **1376**
  protective, on Al and alloys, **3446**
Filters (See also Networks; Quadripoles)
  a.f., for speech amplifier, **1336**
  amplitude, **1460**
  band-, high- and low-pass, design of, **2499**
  band-pass, with cavity resonators, **(B)697**
    and Tchebyscheff polynomials, **(A)2475**
    2-element, graphical representation of, **1337**
  branching, microwave, non-reflecting, **2216**
  capacitive-input, design of, **73**
  cavity, for interference reduction, **1479**
  coupling, 3-stage, for wide-band amplifiers, **3073**
  crystal, **(C)1579**
    band-pass, **2215**
  high-pass, 35 Mc/s, **1893**
  infinite-rejection, **385**
  insertion loss and phase shift in, **384**
  ladder, **3070**
    multipolar, normal waves in, **1333**
  lattice, for dm λ, **387**
  low-pass, principles and construction of, **1001**
    coaxial, u.h.f., **1613**
  microwave, with λ/4-line couplings, **695**
  using modulation, **(D)669**
  prototype, calculation of, **999**
  resistive terminations for, **386**
  theory of, **365**
  u.h.f., **1612**
  waveguide, wide-band, **(A)2443**
    λ/4-coupled, **1000**
  Zobel, attenuation in, charts for, **1334**
Finishing, protective, of electrical equipment, **1057**
Flaw detection (See also Ultrasonic applications; X-ray applications
  ultrasonic, **1113, 1426**
  by X rays and γ rays, **2305**
Fluctuations (See also Noise)
  electric, experimental investigation of, **1520**
    statistical theory of, **1213**
    theory of, **2419**
  in quasi-sinusoidal quantities, **77**
  random, in c.r.o. with high-gain amplifier, **252**
  spontaneous, in valves, **2418**
Fluorescence (See also Luminescence)
  activation by Mn ions, **1375**
  and conductivity, of $ZnSiO_3$, **1051**
  of (Mg, Zn) (W, Mo)O_4, **2260**
  and phosphorescence, **(B) 453**
  of silicate phosphors, **2258**
  of tungstates and molybdates, **2802**
Fluorescent materials, for c.r. tubes, **3131**
  effect of X rays, **123**
Frequency allocations, general review, **1747**
    Atlantic City conference, **1154, 1155, 1156, 1492**
    narrow-band f.m., for amateurs, **536**
  analyser, l.f., cinematic, **2002,** principle of, **2003**
  changers, diode, theory of, **3233**
    gain and noise figures at v.h.f. and u.h.f., **1599**
    thyratron, **2178**
  comparison, by beat method, **3463**
    short-period, **(A)481**
  composition, in naval communication transmitters, **2278**
  control, automatic, microwave, **276, 847, 1196**
    by quartz crystals, **143**
    by tuning fork, **1767**
    of 3-phase alternators, **2178**
  conversion, in receivers, **247**
  converters (See also Converters, frequency) **(A)2596,** 28–54 Mc/s, **1736**
  deviation, in f.m. reactance-valve circuits, **2751**
    linear, in wide-band f.m. system, **2656**
  dividers, halving circuit, **55**
    negative-transconductance, **1885**
  instantaneous, of f.m. oscillator, **1681**
  measurement for f.m. transmitters, **2856**
    for m and dm λ, **2004**
    by sliding harmonics, **(A)2552**
    at u.h.f., **1680**
    at 10000–50000 Mc/s, **2015**
  meters, a.f. and ultrasonic, **2292**
    direct-reading, **2016,** superheterodyne, **3186**
    thyratron-capacitor, theory of, **3187**
  modulation See Modulation, frequency
  multipliers, pre-tuned, band-pass, **684**
    using 6L6G, **2202**
  negative, **1866**
    and positive, **(D)1867**
  response, of loudspeakers and microphones, curve tracer for, **2439**
    measurement at a.f. for broadcasting, **1406**
  stability, of oscillatory circuits, **1581**
  standards (See also Standard frequency)
    and applications, **(D)2277**
    crystal-controlled, portable, **3167**
    and electronic counters, **482**
    microwave, **483**
    WWV broadcasts, **171**
  substandards, portable, **3166**
Frog, and electrical science, **903**

G

Galactic radiation, r.f. See Cosmic noise, r.f.
Galvanometers, immersion, antivibration, **2846**
  moving-coil, with adjustable sensitivity, **1085**
    as circuit elements, **3366**
    short-period, **3175, 3456,** coils for, **3174**
  with negative feedback, **476**
  vibration, improvement of, **3457**
Gases, ionized, h.f. energy in magnetic field, **1908**
Generators (See also Oscillators; Signal generators)
  a.c., automotive, **1167**
  e.s., electric fields in, **2644**
    h.v., **199, 3483,** Berkeley, **(A)2311, (A)2312**
    Van de Graaff, **3258**
  mechano-piezoelectric, for pulses and short time intervals, **2570**
  multiple-pulse, for radar synchronization, **984**
  pulse, **3191**
    portable, **2301,** 5-kW, **596**
  RC, nonlinear theory, **1299**
    oscillations in, **3047**
    50 c/s–1Mc/s, **979**
  sawtooth, design of, **1587**
    linear, **2746**
  sine-wave, 2-phase, variable-frequency, **2486**
  substandard, for m λ, **978**
Geomagnetic storms (See also Solar activity) **1636**
  and differential penetration, **1945**
  1st March 1941, effect on cosmic radiation, **3113**
  April–June 1947, **720,** July–Sept. 1947, **1937**
Geomagnetism (See also Ionosphere; Solar activity)
  a.f. fluctuations, **3408**
  crochet at Abinger, **2234**
  currents causing solar and lunar variations, **1024**
  D and H at Jassy, 1941–1947, **1933**
  diurnal variation of H near magnetic equator, **1936, 2790**
  effect of moon, **3109**
  and elementary particles, theory of, **3407**
  forecasting diurnal variation of declination, **103**
  Frenkel's theory, **(D)104**
  induction effects, **1028**
  K-indices, Abinger, April–June 1947, **719,** July–Sept. 1947, **1931**
    Cheltenham, Jan.–June 1947, **718,** July–Sept. 1947, **1930**
  magnetic elements for Sikkim and Southern Tibet, **1928**
  magnetic inclination at Jassy, 1941–1947, **1934**
  main field and secular variation, **(B)1645, (AD)3409**
  mean K-indices and C-values for 1946, **1929**
  and polar e.m. wave propagation, **729**
  recent data for Japan, **717**
  secular variation of, **3112,** 1905–1945, **(B)1645,** at Jassy, 1931–1947, **1935**
  sudden commencements, **1932,** in Greenwich records, **2235,** June 1941, **2789,** Jan.–June 1947, **719,** July–Sept. 1947, **1931**
  and terrestrial electricity, bibliography of, **1918**
  theory of origin, **2517**
  underground field, **1634, 1635, 2776,** variation with depth, **2516**
  1945 deviation chart, data for, **3111**
Glass, electrically conducting, **3437**
  physical properties and structure of, **2829**
  welding, spark oscillators for, **(A)2574**
—— **scale,** as mica substitute, **2823**
Glasses, solder, **3445**
Glossary of terms in waveguide technique, **(B)3356**
Greenwich Observatory, history of, **2425**
Gyrofrequency, experimental determination of, **2238**
Gyromagnetism, theory of, **3092**
Gyroscopes, electronic balancing of rotors, **203**

H

Harmonic analysis See Waveform analysis
Hartley law, extension of, **1491**
Hearing, effect of noise, **1536**
  influence of interaural phase on masking, **2140**
  loudness matching of short tones, **(A)3317**
  loudness of repeated short tones, **3314**
  normal, measurement of, **1227**
  perception of repeated bursts of noise, **2138**
  perception of short bursts of noise, **2137**
  relaxation theory of, **1848**
  resonance theory of, **3003**
  theory of, **7, 923, (A)3312,** and perception of pitch, **322, 1225**
  thresholds, atonal interval, **2136,** monaural and binaural, **1535**
—— **aids, 1246, (B)2714**
  body-baffle effects, **1248**
  comparison tests for, **2711**
  gain measurement of, **2157, 2442**
  Medical Research Council report, **(A)1245**
  miniature, **1247**
  Models 65 and 66, **2156**
  valve design for, **(A)2430**
Heat conduction, in light-scattering material, **394**
Heating, dielectric, h.f., **201, (B)221,** theory and applications, **2036,** for woodwork, **505;** u.h.f., of frozen food, **504**
  h.f., generator for, **1428,** industrial, physics of, **1109**
  induction, h.f., **201, (B)221, 1116,** formulae for, practical applications of, **2035;** of metals, **2872**
Heterodyning, and modulation, **235, (D)1144, (D)1145**
High voltage (See also Breakdown; Corona)
  measurement, by ellipsoid voltmeter, **(A)2561**
    spark-gap calibration for, **(D)2850**
    for pulse voltages at 200 Mc/s, **1688**
Horns, exponential, acoustic, design of, **326**
Hydrophones, and crystal tranceivers, calibration of, **2434**

I

Ice, dielectric properties of, **1077**
Ignition mechanism, of Hg-cathode igniters, **830**
Ignitrons, for high-power rectifier control, **2928,** Types BK22 and BK24, **3547**
Impedance (See also Charts; Circle diagrams; Transmission lines)
  acoustic, continuously-variable, **913**
    of various materials, **928**
    measurement of, **2133, (A)3305,** by feedback method, **(A) 3307**
      by short-tube method, **921, (A)3308, (A) 3309,** for porous screens, **(A) 2134, 3310.**
    of sound source, **(A) 2132**
    of surfaces in water, **920**
  or admittance, of quadripoles, circle diagrams for, **(A) 3357**
  aerial, measurement of, **1678**
  concept, and wave propagation, **(D)3491**
  functions, approximation methods, **3040**
  input, of shunted amplifiers, **2758**
  matching, of h.f. transmission lines, **2167**
    with irises, **649**
    by L networks, **1259**
    measurement of mismatch in waveguides, **468**
    transformer for, **1296**
    λ/2 transformers for, **3042**
  mismatching unit for λ 3 cm, **2017**
  measurement, **(A)2552**
    accuracy of, **3170**
    bridge for 20–140 Mc/s, **(A)181**
    h.f., **470, 2001, 2012**
    indicator for λ 3 cm, **(A) 2552**
    by Lecher wires, **2843**
  meter, direct-reading, **2851**
    v.h.f., frequency-scanning, **2852**
  of parallel-wire grid for oblique incidence, **2589**
  presentation on reflection-coefficient plane, **771**
Inductance measurement, at r.f., **183**
  self, of circular arc, **1015**
Inductors, air-cored, losses in, **(A)2475**
Industry, German, reports on, **(B)1526,** index of, **1843**
  Japanese, reports on, **(B)1526**
Information sources, British, **(B)3284**
Infra-red developments, survey of, **3473**
  image-converter tube, **1710**
  instruments and methods, **2868**
  radiation, coupling with supersonic field, **(A)2574**
Instruction and training, of electrical engineers, **902, 2424**
Instruments, aircraft, principles and design of, **2883**
  design of, **474, (AD)2837**
  electrical and acoustical, at Physical Society's Exhibition, 1947, **179**
  measuring, for cm λ, **475**
Insulating materials (See also Ceramics; Dielectrics; Glass; Mica; Plastics; Rubber; Silicones)
  Ba-Mg titanates, **3441**
  ceramic sheets for capacitors, **146**
  ceramics, **3440,** semiconducting glazes for, **1061**
  Cu deposition on, **2544**
  for electrical machines, **751**
  mica, Australian, **3140**
    capacitance stability, **447**
    and micanite, **2814**
    synthetic, manufacture in Germany, **448,** magnetic susceptibility of, **3434**
  oil, **(A)3143**
  organic, h.f., and chemical structure, **1385**
  paper, kraft, **1384,** vacuum drying of, **1383**
  polythene, electric strength of, **2267**
  recent researches on, **2819**
  resin-bonded boards, manufacture of, **1661**
  silicone board, **1377**
  synthetic, hardening in h.f. fields, **2822**
  work function and energy levels in, **1980**
Insulation, gaseous, for h.v. apparatus, **1976**
Insulators, glass, silicone coatings for, **746**
  h.f., for high power, **1386**
  stabilized, with semiconducting glazes, **444**
Intercommunication systems, for aircraft, and transducers, **2433**
Interference, from aircraft electrical equipment, **2602**
  from broadcasting transmitters, **2098**
  effect of receiver bandwidth, **1701**
  from electrified railway, **1744**
  in f.m., **1147**
  between f.m. signals, **813**
  from ignition systems, **253, 1148**
  impulsive, in a.m. receivers, **2901**
  in merchant ships, **2900**
  reduction, by cavity filters, **1479**
  mutual, in ships of the Royal Navy, **2348**
  by sky-wave reflections, **230**
  suppression, in television, **254, 538, 580**
  in television, from amateur transmitters, **579**
  between transmitters with adjacent aerials, **2906**
  at v.h.f., **3237**
Intermodulation, meter for, **2296**
  products, direct calculation of, **2205,** table of, **2188**
Interpreting system at Lake Success, **637**
Ionosphere (See also Atmosphere, upper; Meteors; Solar eclipse; Solar radiation; Wave propagation, e.m.)
  absorption, approximate solution for, **3115**
  anisotropy effect, **1032**
  Appleton's work, **1358**
  basic properties and processes, **1944**
  conditions, investigation and forecasting of, **2048**
  critical frequency forecasting, **419**

  D layer, conductivity of, 3116
  differential-penetration theory, 726
  disturbances, and radio communication, 2050, 2885
  effect of solar eclipse of 1st Oct. 1940, 1924
  electron distribution in, 725
  electron production in, 724
  experimental determination of gyrofrequency, 2238
  F region, abnormalities at Calcutta, 2522
    lunar tides in, 106
  F_2 layer, electron density near equator, 2239
    ionization and geomagnetic latitude, (D)1031
  magneto-ionic splitting of e.m. waves, by F layer, 2594, 2595, 3221, 3222, by sporadic-E layer, 2051
  height measuring equipment, 2294, recorder, 1639, 2240
  inhomogeneities, effect of, 420
  layer above F_2 layer, 2242, and aurora, 2243
  perturbations in auroral zone, 421
  research, 1354, at College, Alaska, (B)2795
  and solar activity, 727, 3110
  sporadic-E clouds, motion of, 3117
  sporadic-E region, location of, 3410
  sporadic-F_2 layer, theory of, 105, 1030
  survey, 107, 417, 723, for 1947, 1360
  Swedish investigations during eclipse of 9th July 1945, 1925
  virtual height of, measurement at 100 kc/s, 1946
  war-time work of I.R.P.L., 2049
Iron, temperature changes during magnetization of, 2805

J

Junctions, broad-band, for waveguides and coaxial lines, 835
  hybrid, for waveguides, 2163, 2165

K

Klystrons See Valves

L

Laboratory, acoustics, Parmly (Chicago), 1231, mobile, N.P.L., 1534; cosmic-ray, Italian, 2233; research, G.E.C., 1524; for television-receiver testing, 2279
Lamps, concentrated-arc, for light-beam communication, 585
  fluorescent, 1390
Langevin, Paul, scientific work of, 621
Laplace's equation, solution by resistor network, 1071
Lead sulphide, physical properties of, 1656
Lecher lines, theory of, and related problems, 338
Lenses (See also Electron lenses)
  microwave, metallic, 2176, 2465, 3032
  plastic, 756
    for television projection, 3154
  wavelength See Aerials, polyrod
Library, scientific, French, in London, 1215
Light, fluorescent, 1390
  intensity measurement by pulse technique, 206
  L. de Broglie's theory of, 1616
—— **beam**, pulsed, use for surveying, 3211
Lightning, analysis of 37 discharges, 1362
  arresters, discharge currents in, 3389
  ceraunometer discharge recorder, 2794
  research in Switzerland, 110
  warning device, (D)2793
Location, of pieces of iron in timber, 3212
Loudspeakers, damping of, (D)13, (D)938
  design by electromechanical analogy, 939
  diacone, 937
  double system, 1850
  duocone, 1240
  electrodynamic, energy transformation in, 2703
  feeding in parallel, 14
  and high-quality reproduction, (B)3333
  horn, 3330
  loudness-efficiency rating of, 2152
  multiple, matching for, 940
  quality assessment of, 2440
  rating of, 324
  single-diaphragm, 2702
  transient response of, 3009, (A)3331
  triple system, 2705
Luminescence, of alkali-halide crystals, 3128
  of CaS.SrS phosphors, 3127
  of Ce compounds, 3425
  rise and decay of, 3130
  of simple oxide phosphors, 3420
  of solid solutions, 2259
Luminescent materials, (C)1649
  applications of, 1973

M

Magnetic field, of air-core coils, 1350
  of massive rotating bodies, 415, 710, 1022, 1023, 1633, 1927, 2775, (D)3106, 3406
  measurement in electron microscope lenses, 611
  meter using Hall effect in Ge, 3172
  screening by spherical shell, 705
  theories of, 3394
  uniform, between coils, 400
—— **focusing**, fringing corrections, 1124
  between plane-inclined pole-faces, 409
—— **leakage**, evaluation with electrolyte tank, 2558
—— **lenses** See Electron lenses, magnetic
—— **materials**, (See also Alloys; Ferromagnetic materials) 1862
  characteristics of, 3146
  permenorm 5000-Z, (A)3431
  soft, effect of rust and recrystallization, 1983
  supermalloy, 132, 2806
—— **measurements**, on high-μ materials, 176
—— **properties**, a.c. measurement of, 2006
  of Cr-Ni-Mo steel, effect of heat treatments, 1975
  of ferromagnetic laminae, 1979
  measurement, with c.r. B-H tracer, 177, for fine wire, 1088
  of Ni-Fe alloys, 3428
—— **storms** See Geomagnetic storms
Magnetism, of ferromagnetic materials, theory of, 706
  magnetic effects of marine currents, 2788
Magnetization, of bars, anomalies, 3432
  curves for alsifer alloys, 1984
  losses in Fe at high flux densities, 3455
Magnetometers, airborne, 220, stabilized, 798
  high-μ, for automatic steering control, 499
  recording, 472
Magnetostriction, abac for resonant frequencies, 1
  curves for alsifer alloys, 1984
  of Ni, 408
Magnetrons See Valves
Magnets, loudspeaker, production testing of, 473
  permanent, alloys for, 1663, quality control of, 449
    design of, 753
    half-cycle magnetizer for, 2543
    materials for, 2826
Masts, radio, transportable, for B.B.C., 287
Matching ranges, for transmitters, 595, (C)2097, 2401
Mathematical tables, Bessel functions, (B)463, (B)1396
  Laplace transformation, (B)3450
  various, of Bureau of Standards, (B)162
Mathematics, applied, for engineers and physicists, (B)1394
  Bessel functions, applied, (B)2275
  calculus, matrix and tensor, (B)1395
  differential equations, approximate solution of, 2835
    integration with punched-card machines, 1667
  differentiation, electrical, errors of, 2271
  escalator process, for damped Lagrangian frequency equations, 3162
    for simultaneous equations, 3163
  Fourier analysis, graphical, 1067
    of sound films, using photoelectric transformer, 2432
  Fourier integrals, graphical methods for evaluation, 154
  Fourier transforms, in aerial theory, 155, 1068, 2270, 3159
    of incomplete Gaussian function, 2833
    and structure factors, (B)2269
  functions, aleatory, stationary, 1666
  hyperbolic functions, complex, nomograms of, (B)1986
  integrals, tabulation of new transcendental function, 3158
  integration, electrical, errors of, 2271
  Mathieu functions, theory and applications of, (B)1397
  matrix theory, for ladder networks, 2189
  for modern electrical engineering, (B)161
  operators, eigenvalues of, determination by RC circuit, 457
  for radio engineers, (B)2274
  sum of vectors of random phase, 3164
  tensor analysis, application to elasticity and piezoelectricity, 3083
  transforms, Laplace and Cauchy, and applications, 458
Measurement (See also individual subjects)
  apparatus, French and American, 2559
    and methods, for cm λ, 475, 1076, 3454
  electrical, by phase displacement, 1670
  functional analysis of, 466
  technique, for dm waves, 2839
    fundamentals of, 390
    h.f., using transmission lines, (B)2030
  at u.h.f., 1988, at v.h.f., 1408
Mechanics, nonlinear, introduction to, 156
Mesons (See also Cosmic rays)
  mass and disintegration products of, 715; production process, 101
Metallurgy, new metals for old, (A)152
  powder, (D)150, 151, 451, abstracts, 2545, metal ceramics, 2828
Metals, electrical and physical properties of, 3150
Meteorology, and radio propagation, 2060, 2236
Meteors, evaporation of, and scatter clouds, 91
  ionization effects of, 92, 93, theories of, 3401
  and ionospheric abnormalities, 3402
  radio observations of, 411, 2778, 2779, 2782, for 1946 Giacobinids, 2780, 2781, for 1947 Perseids, 2511
  trails, electron density in, 1025, reflection of v.h.f. waves from, 2328
  velocity determination by radio diffraction, 3101
  whistling, 3403
Meters, decibel, comparative, 1094
  electric-field, for aircraft, 2287
  electronic, millisecond chronoscope, 465
  expansion, electric, and applications, 1420
  gain, a.f., 3471
  long-scale, for electrical quantities, 3173
  for peak programme voltages, 992
  resistance, r.f., 3460
  s.w.r., micromatch, modified, 3176
  universal, design and construction of, 193
Microphones, absolute calibration of, 919
  construction and characteristics of, 1239
  crystal probe, (A)3327
  rating of, 324
Microphony, in subminiature triode, 3556
Microwaves (See also Wave propagation, e.m.)
  absorption by air, 594
  emission by relativistic electron, theory of, 594
  physics and technics of, 2116
  technique of, (B)2683, (B)2865
  theory and application of, (B)2682
Milliammeters, thermocouple, at v.h.f., (D)1409
Mine detectors, (A)2882
  E.R.A. Locator No. 7, 218
Mines, magnetic and acoustic, British developments, 790
Mirrors, plastic, 756
Missiles, guided, 2324
    and rocket, German, 1130
Modulation, a.m. *vs* f.m., (D)543
    for broadcasting, 261
  a.m. and f.m., multitone, theory of, (D)2403
  frequency, 1496, (B)2087, (D)3512
    bandwidth and modulation index, 859
    energy distribution in f.m. wave, 3541
    interference problems in, 1147
    of magnetron, (A)2614
    mathematical theory of, 461
    measurement of deviation ratio, 1404
    network response, (D)674
    review of, 2817
    simplified, (B)2638
    stabilized system, 860
    transmission and reception, (B)3526
  and heterodyning, 235, (D)1144, (D)1145
  light-beam, distortion in, 3000
    by ultrasonic cell, 1847
    and waveform analysis, 1087
  pulse, 1497
    methods of, 1498
    spectrum of, 1807, 2619
    standardization of nomenclature, 3249
    theory and practice of, 2620
    wide-band, 2621
    of 5–300-Mc/s signal generators, 1699
  pulse-code, 818, 1161, 1499, (A)2363, 2626
    electron-beam tube for, 2411
    multichannel, 2366
    for telephony, 258, 545
  pulse-count system, 544, 2622
  pulse-duration, distortion in, 861
  pulse-position, without fixed reference, theory of, (A)2614
  pulse-time, noise suppression in, 2607
  of resonance lines in Cs arc, 2353
  and sidebands, 1197
  systems, design problems of, 1808
  time, 862
  u.h.f., 1788
    in waveguides, 54
  velocity, principles of, 893
Modulators, bridge and ring, linear theory of, 3058
  class B, distortion correction in, 1809
  frequency, phasitron, 1495
    with reactance valves, 2406
  pulse, hard valve, 863
  radar, high power, 864
  reactance, crystal controlled, 2958
    extension of linear range, 2657
    theory of, 1589
    wide deviation, 2489
  ring and Cowan, analysis of, 3543
    design of, 3542
  50-W, with peak limiting, 1590
  120-W, 58
Molybdenum, oxide films on, 742
Monitoring, of foreign broadcasts, B.B.C. station for, 249
  of frequency and modulation, for television and f.m., 2571
Monitors, for f.m. broadcasting, 488, 2861
    and television sound, 229
Moon, effect on recurrent geomagnetic activity, 3109
  magnetic field of, 710
  as passive repeater for radio links, (A)547, 2916
Motors, synchronous, phase-sensitive, 2641
Multivibrators, graphical design of, 2748
  positive-bias, degenerative, 1884
  step-down by rational ratios, 2747
  study of, 2487
Musical instruments, electronic organ, 2583, 3203

N

Navigation aids, aerial, 2249
    aircraft course computer, (A)2524
    aircraft instrumentation and control, (A)2524
    for airlines, 426, (D)1038
    automatic pilot for transatlantic flight, 1037
    beacons, (B)3418, design of universal system, (A)2524
    characteristics of, (A)430
    including Decca, 113
    long-range, c.w., 1958
    navar, tests, (A)428
    radar, 1959, (B)2255, 3416, targets for, 1043
    radio, (B)1048, 2250, survey, 429
    radiovisor landing system, (A)2524
    shoran, use for surveying, 2251
    short-distance, c.w., 1960
    U.S. airport radio-range equipment, 2634
    v.h.f., short-range, in U.S.A., 427
  marine, international recommendations, 112
    radar, at Douglas (Isle of Man), 2248, at Liverpool, 3415, for river boats, 425
    radio, second international conference on, 2247
  sofar [sound fixing and ranging], 2797
—— **systems**, aerial, 1961
    consol, 2252
    Decca, 1646
    lanac, 1041
    teleran, 1647
    tricon, 1364
    VOR, 3123
Network analysis (See also Circuit analysis) (B)3381
  chain-relaxation method of, 3365
  phase tables for, 968
Networks (See also Circuit theory; Filters; Impedance; Quadripoles)
  bridged-T, design and applications of, 1295, theory of, 2735
  coaxial-cable, 645
  compensation, a.f., design of, 2435
  constant-current, (A)2475
  dissipative, microwave, for broad-band matching, (A)2475
  junction, Y-β for, 676
  linear, analysis of, 2187
  machine computation of, 160
  microwave, matrix computation of, 1073
  mixing, design and use, 1338
  parallel-T, 971, design curves, 3038, RC, asymmetrical, 47
  properties of, 3364
  rectifier, for multi-position switching, (A)2475
  response to f.m., (D)674
  theory of, extensions of, 1292
  transient response of, adjustment of, (A)2475
  wide-band, phase-splitting, (A)2475, pulse-testing of, 1101
  4-terminal, symmetrical, transient response of, 1611
Nickel, for cathodes, factory tests of, (A)2547
  metastable states of, 3429
Night-sky light, and auroras, 730; infra-red band at 1.04μ, 1644; origin of, 1642, 3411; and solar radiation, 1643
  spectrum, in blue and violet, 2523
Noise (See also Cosmic noise; Fluctuation; Solar noise; Valves)
  a.f., reduction of, (A)2146
  in amplifiers at u.h.f., 3067
  background, due to sea waves, 251, 1742, in valves, measurement of, 489
  characteristics, of pulse-length-modulation system, 2606, of radar receivers, 816
  factor, measurement of, 1482, 2860
    for receivers, 1481, 1743
  fluctuation, effect on pulse distortion, 2351
    in pulse-height multiplex radio links, 815
  h.f., production by ionized gas in magnetic field, 1623
  inherent, in receivers, measurement of, 2349
  meters, accuracy of, (D)1484
    for broadcasting stations, 3189
    extension of frequency range of, (A)2552
  methods of study of, 3005
  in nonlinear systems, 1480, 2350, 3238
  physiology of, 3301
  in pulse communication systems, 2605
  random, plus sine wave, properties of, 2219, in radio receivers, 1483
  reduction, properties of felt, 929
    in amplifiers and mixers, (A) 1600
    theory for radar and communication, 2903
    in triodes and amplifiers at u.h.f., (A) 1592
  in resistors and valves, 2220
  sources, diode, 1693, for receiver testing, 490, 3192
    pulse, for f.m. receiver testing, 1418
    use of transmission line diode at cm λ, 2073
    for 0.1–5 Mc/s, 875
  suppression (See also Sound reproduction)
    circuit for, 1487
    in p.m. systems, (A) 531
    in pulse-time modulation systems, 2607
  thermal, in resistors, (D) 2072, (C) 3239
  valve and circuit, compensation of, 3358
    in electrometer valves, (A)899
    and transit time, 2420
  in 1–30-Mc/s band, survey of, (B)534, 1741
Numeroscope, 1574

O

Ohm's law, 83, 901
Ohmmeter, multi-range, 1100
Opinion meter, 1118
Organ pipes, open, end-corrections and harmonics of, 2126
Organs, electronic, 2583
Oscillations, forced, in nearly sinusoidal systems, 2740
  molecular, mechanical model of, 392
  relaxation, discontinuous, 2476
  sawtooth, 3056
  in self-oscillatory systems, 456
Oscillators, a.f., electromechanical, 2712, f.m., resistance-tuned, 368, single valve, 2203, variable, 1414, wide-range, 50
  amplitude-stabilized, 980, pseudosynchronization of, 3044, theory of, 1883
  autostabilized, 1306
  beat-frequency, construction of, 369, h.f., 1584, precision, 2568, with quartz control, 190
  blocking, 877, operation of, 1880, theory of, 1305
  with bridge circuit, 380
  crystal, 2196, negative-resistance, 1882, series-mode, 3048, variable-frequency, 2194, v.h.f., 1301, use of EF50 for, 981
  with external amplitude limiters, 2801
  harmonics in, 1593
  impulse-synchronized, 387
  LC, high-stability, 2193, 3374
  with long feeder, theory of, 2200
  magnetostriction, cylindrical, 2997, laminated, (A)3328, radial, for underwater signalling, 2698
  master, f.m., for high-fidelity broadcasting, 2402
  microwave, design of, use of Rieke diagrams, 3371
    frequency stabilization of, 1311, 3065

    using ordinary valves, **3052**
  mode separation in, (**A**)**2475**
  RC, (**A**)**1298**, frequency control of, **49**, ladder-type, **1307**, optimum conditions for, **1580**, theory of, **1881**
  reflex, **611**, **614**, for radar, **1518**
  resonant-line, push-pull, for 166–170 Mc/s, **1586**
  spark, for glass welding, (**A**)**2574**
  sweeping, wide-range, **51**
  Thompson, loosely-coupled, synchronization of, **1582**
  transitron, **2485**, **3054**, theory and practice of, **1879**
  triode, pulse, tunable, **1878**
    for λ 8 cm, **983**
  u.s.w., **52**, **683**
  valve, **976**
    feedback, grounded-grid, **2484**
    self-modulation of, **3053**
    synchronization by a harmonic, **1308**
    with third-harmonic tuning, **1609**
    u.s.w., high-power, **53**
  variable-frequency, cathode-follower, **375**, selsyn driven, **2744**
  for 8800–9500 Mc/s, **982**
  using 6L6G, **2202**
Oscillographs; Oscilloscopes See Cathode-ray
Oxygen, molecular and atomic, in upper atmosphere, **418**

P

Paints, conductor, (**A**)**1614**
Particle accelerators, **1711**
  beam dynamics in, (**A**)**2317**
  betatron, electron-beam displacement in, **3206**
    pulse excitation of, **2315**
    15-MeV, **3207**
    16-MeV, **3482**
    22-MeV, electron current in, **2586**
    100-MeV, power supply for, **508**
  circular, for heavy particles, **794**
  cyclotron, automatic resonance control for, **2875**
    automatic synchronization of, **2038**
    f.m., **2314**, oscillator design for, (**A**)**2574**, r.f. system for, **1712**
    h.f. generator for, **2874**
    h.f. measurements on model, **3480**
    internal targets for, **795**
  for electrons, with air-cored field, **206**
    basic techniques, **1119**
    e.s., **1120**
    induction, European, (**D**)**509**
    linear, **2584**, travelling-wave type, **506**
    multistage, voltage distribution in, **3205**
  linear, Berkeley, design of, (**A**)**2316**
    electron dynamics for, **2873**
    field control in, (**A**)**2319**
    method of feeding, **3051**
    oscillator and coupling system for, (**A**)**2318**
  radiation transformers for, **792**
  spiral, design of, **2585**
  synchro-cyclotron, theory of, **793**
  synchrotron, air-core, design, **1432**
    electron-beam displacement in, **3206**
    magnet design for, **1121**
    pole-piece shape for, **3481**
    proton, theory of, **209**, (**C**)**507**, 1000-MeV, **208**
  1-MeV equipment of the Cavendish Laboratory, **2037**
Particles, elementary, and geomagnetic field, theory of, **3407**
  motion of, in magnetic field, **1020**
Permeability, complex, of coil cores, **3137**, with airgap, **2808**
  of Fe, and Weiss domain theory, **3089**
  h.f., of ferromagnetic materials, **136**
  initial, of Fe, **3136**
  of low-conductivity materials at cm λ, **2807**
  measurement in weak fields, **175**
  of Ni-Fe alloys, **3427**
  of powdered-iron ring cores, measurement of, **471**
  vector, **1349**
Phase and its meaning, **2734**
  angle, measurement of small variations at a.f., **1078**
  changer, waveguide, adjustable, **1255**, **3338**
  inverters, self-balancing, (**D**)**2192**
  measurement, by standard delay line, **1683**
  monitor, for broadcast arrays, **1092**
  reverser, a.f., automatic, **677**
  shift, compensation at l.f., (**A**)**355**
Phosphors, alkaline-earth, properties of, **1372**
  CaS-Pb, influence of infra-red rays, **1651**
  CaS.SrS, luminescence of, **3127**
  luminescence of, **1373**, **2261**, rise and decay of, **3130**
  mixed, with mixed activators, **3129**
  oxide, luminescence of, **3420**
  spectral power distribution of, **3426**
  sulphide and silicate, luminescence mechanism of, **3421**
  Zn-Cd, luminescence of, effect of heat, **1049**
  ZnS, efficiency of, **3422**
    luminescence decay of, **3423**
    luminescence efficiency of, **2801**
  $ZnSiO_3$, activation by Mn ions, **1375**
    fluorescence and conductivity of, **1051**
Photocells, barrier-layer, e.m.f. and internal resistance of, **600**, theory of, **1202**
  effect of gases on PbS layers, **3148**
  for facsimile, **2961**
  hot-cathode, **1817**
  improvement of characteristics of, **1816**
  local sensitivity variations of, **1814**, **2960**
  PbS, photoconductive, for sound reproduction, **1200**
  PbS and PbSe, h.f. characteristics of, **2661**
  PbSe, **1815**, spectral response of, **2662**
  PbTe, **2660**
  properties of CdS layers, **3147**
  Sb-Cs, **1511**
  Se, addition law for, **1201**, mechanism of, **312**
  spectral senstivity of PbTe layers, **3132**
  stricture of PbS and PbSe layers, **2959**
  Tl_2S, manufacture of, **1813**
Photoconductivity, of CdS, CdSe and CdTe, **450**
  and luminescence, in ZnS, **3080**
Photoeffect, barrier-layer, theory of, **3079**
Photoelectric currents, small, pulse method for measurement of, **1672**
—— **properties**, of InS and InSe, **1388**
Photography, of c.r. tube traces, (**B**)**2982**
Photoluminescence, of ZnO, **1374**, of ZnS, **1650**
Photostat service, at Science Museum, **2111**
Pickups, capacitive, with high a.f. output, **632**
  crystal, **918**, single-shear, **3302**
  film, for television, **2846**
  valve, for lateral records, **1820**
Piezoelectric crystals, (See also Crystals; Quartz)
  culture of ADP crystals, **2535**, of quartz crystals, **1657**, **3433**
  EDT and DKT, **740**, **2803**, constants of, **3134**
  Rochelle salt, electromechanical properties of, **124**
  vibrations of compound rods, **80**
—— **effect**, in $BaTiO_3$ ceramics, **741**
Piezoelectricity, application of tensor analysis, **3083**
  equations of, **3082**
Planck, Max, life and work of, **1841**, **2675**, **3574**
Plasma oscillations, **1346**, **2506**
  sheaths, as variable capacitors, (**A**)**2329**
Plastics, (See also Insulating materials)
  British International Annual, (**B**)**1665**
  effect of fungi and humidity on, **3153**
  in electrical industry, survey, **452**
  electrical properties of, **3443**
  for electrical and radio engineers, (**B**)**1066**
  impact testing of, **1065**
  metal-coated, **3155**
  as optical materials, **3156**
  and rubbers, properties of, **3152**
Plating, on non-conductors, **2544**
Polarization, circular, and f.m. coverage, **227**
Popov, A. S., life and work of, **1842**
Potential distribution, on metal or semiconductor surfaces, **3386**
  divider, double, for measurement of L, C and R, **1075**
  function, between cylinder and parallel planes, **3081**
  gradient, atmospheric, measurement of, **1674**, **2840**
Potentials, scalar and vector, **702**
Potentiometers, recording, oscillator-controlled, for r.f., **1428**
  self-balancing, **768**
Power loads, at v.h.f. and u.h.f., (**A**)**559**
  loss, measurement for iron, (**A**)**1082**
  measurement, by calorimeter at λ 3 cm, **2024**
    at cm and dm λ, **2022**
    at h.f., **2012**, **3188**
    at λ 10 cm, (**A**)**2552**
    milliwattmeter for 8700–10000 Mc/s, **187**
    in rectangular waveguides with enthrakometer, **2020**
    r.f., by bolometer lamps at cm λ, **2025**, by differential thermometer, **1093**
    at 3000 and 10000 Mc/s, with tapered water loads, **2023**
  meters, aerial, **2021**
—— **supplies**, for aircraft communication equipment, **2646**
  controlled, for heavy d.c., **2380**
  emergency systems using accumulators, **2378**
  h.v., for counters, **3066**
    for television receivers, **286**
  radio, use of constant-voltage transformers, **282**, **1173**
  stabilization of, **564**, **2934**
  stabilized, **285**, (**A**)**2639**
    d.c., low-impedance, **3529**, nobatron, **284**
    l.v., high-current, **283**
  for transmitters, characteristics of, **281**
  vibrator, **3528**
  voltage stabilization of, **1765**
Precipitation static See Electrostatics
Pressure measurement, variable capacitor for, **200**
Probability, random flights problem, (**D**)**699**
  random walk problem, **701**, and applications, **700**
Propagation See Wave propagation
Protection, of iron against rust, **441**
  of lead-cased cable against corrosion, **3015**
  overvoltage, enclosed spark gap for, **832**
Public address systems, for United Nations auditoria, **15**
Publications, Nucleonics, **622**
  Quarterly Journal of Mechanics and Applied Mathematics, **153**
  Research, **620**
Pulse technique, recurrence-frequency selectors, **987**
Pulses, d.c., short, measurement by c.r.o., **2555**
  h.f., production of, **2204**
  millimicrosecond, generation by electron bunching, **2745**
  rise-time abac, **2492**
  measurement of rise and decay time, **189**
  photography of wave shape, **288**
  voltage, in rectifiers, **1286**
Pumps See Vacuum pumps

Q

Q measurement, at u.h.f., **1680**
  meter, for 10-cm echo boxes, **2005**
  multiplication, with negative-resistance circuits, (**A**)**2475**
Quadripoles, (See also Networks)
  in closed chains, theory of, **967**
  theory of, **1577**, **2191**
Quality control, of permanent-magnet alloys, **449**
Quantum mechanics, principles of, (**B**)**1917**
—— **theory**, of radiation damping, **2223**; second quantification, **1615**; of wave fields, **3078**
Quartz, α- and β-, piezoelectric characteristics of, **2538**
  artificial electrical twinning of, **142**
—— **bars**, equivalent circuit for, **3049**
  even-harmonic excitation of, **3383**
—— **clocks**, for National Bureau of Standards continuous time signals, **2276**
—— **crystals**, (**A**)**2812**
  equivalent circuit for, **1389**
  frequency calibration of, **1405**
  for frequency control, **143**
  growing of, **3433**
  oscillations of, interferometry for, **3400**
  plated, h.f., **1877**
  possible American sources of, **2813**

R

Radar, automatic-tracking, SCR-545-A, **2530**
  circuit techniques for, **1874**
  detection of small pulses through noise, **1146**, (**D**)**2899**
  Doppler, basic principles of, (**A**)**2524**
  dynamic balancing of scanners, **2253**
  echoes due to clouds, rain, etc., **2062**
  engineering, (**B**)**118**
  f.m., principles of, **2798**, techniques, **3124**
  fundamentals of, (**B**) **2533**
  marine, **1370**, **1971**
  maximum range of, (**D**)**432**
  modulators, high-power, **864**
  naval, anti-jamming technique, **2532**
  peace-time applications and developments, **1367**
  precision, **1982**
  principles of, (**B**)**3419**
  for rainfall measurement, **3121**
  range forecasting for, **2330**
  receivers, **1142**, **2067**, automatic control in, **808**, C.H., **809**, c.r. trace visibility, **889**, **1965**, **2985**, c.r. tube screens for, **885**, for gun-laying equipment, **733**, noise characteristics of, **816**, p.p.i. circuits, **1005**
  remote projection p.p.i., minimum signal and target separation, **731**
  responders, testing of, **781**
  for river navigation, **425**
  for storm detection, **433**, **2254**, in aircraft, **1045**
  surveillance, **3416**, deficiencies of, (**A**)**2524**
  systems, for airport traffic control, **114**, **1040**, classification of, (**A**)**1039**, engineering of, (**B**)**435**
  technique and evolution of, **431**, **1366**, **3125**
  test methods for, **779**
  transmitters, C.H., **853**, mobile, m-λ, **854**, survey of developments, **2095**
  war-time developments in Hungary and abroad, **1857**
—— **equipment**, airborne, **115**
    AN/APS-10, **1368**
  amplifiers, i.f., design, **690**
  in Antarctic, **259**

  used by British South American Airways, **1501**
  lightweight, **1004**
  naval, for fire control, (**D**)**732**
  for raid warning and G.C.I. in Australia, **1044**
  video switching and distribution system, **116**
Radiation, damping, quantum theory of, **2223**
  e.m., from aerials, formula for, **390**, from ships' receivers, **2332**
  interaction with matter, **1341**
  in light-scattering material, **394**
Radio activities of the Swiss Post Office, **3575**
  bibliographies, R.C.A. technical papers to 1947, (**B**)**844**
  engineering, (**B**)**2996**
  equipment, in Antarctic, **259**
  fundamentals, (**B**)**1222**
  handbook, (**B**)**2680**
  introduction to, (**B**)**2681**
  progress review for 1947, F.C.C., **905**, I.R.E., **2994**
  in Russia, 1917–1947, **2679**, survey, **1217**, symposium, **1529**
  technical developments, British, (**B**)**320**, British and American, **624**
  technique, theory and practice, (**B**)**1530**, v.h.f., (**B**)**2117**
—— **links** (See also Communication systems; Relay systems)
  broadcasting, high-quality, (**A**)**2614**
  f.m., multichannel, v.h.f., **263**
    R/T, 3000-Mc/s, **551**
  using lunar reflections, (**A**)**547**, **2915**
  microwave relay systems, **550**
  studio/transmitter, **3516**, for 920–980 Mc/s, **3250**
  v.h.f., choice of frequency for, **3518**
Radiogoniometers, h.f. and v.h.f., design of, **3414**, error measurement for, **3413**
Radiography, 1-μs, **1715**
  with 2-MeV X rays, **1115**
Radiophysics and theory of automatic control, **408**
Radiosonde, f.m., German, (**B**)**2588**
  Kew, Mark 1A, **197**
Radiotelegraphy, carrier, frequency-shift, **2354**, **2362**, **2405**, **2913**
    voice-frequency, **1488**
  inventor of, **2429**
  tape relay system, **539**
Radiotelephony (See also Communication systems)
  amateur, on 2350 Mc/s, **2348**
  army field system, **2623**
  beam, cm-λ, **3506**
  common-carrier, **1758**
  between mainland and Corsica, **3508**
  for Middle East oil pipeline, **2368**, **2631**
  microwave, (**A**)**542**
  public service on trains, (**A**)**2614**
  by pulse-code modulation, **258**, **545**
  rural, **2630**, in Colorado, **2629**
  single-sideband apparatus of Dutch Post Office, **1158**, **3510**
  terminals, **1157**
  transoceanic, **1750**
  U.S. airport equipment, **2634**
  v.h.f., multichannel, f.m., **3513**
  vocoder system, (**A**)**2910**
  for water works, **1761**
Rainfall, measurement by radar, **3121**
Reactors, saturable, design of, **2182**, for load control, **665**
  v.h.f., use of flat-plate transmission-lines, **2477**
Receivers (See also Radar; Television)
  alignment, by c.r.o., **184**
    for f.m., **1137**
    with panoramic analyser, **1096**
    reactance adjustment of coils, **1466**
  a.m., f.m. adapter for, **1456**
  for amateur bands, Collins Model 75A-1, **2599**
  band-modulator, **1730**
  broadcast, Bush Model EBS4, **2895**
    citizens'-band, **3511**, portable, **2341**
    Ekco A52, test report of, **2338**
    input circuits for, **2068**, **2897**
    mass production of, **2066**
    Merkur-W, **1463**
    miniature, **1339**
    for motor vehicles, **242**
    permeability tuning of, **71**
    Radiomobile Model 100, **1462**
    for schools, **241**
    selectivity of, **3499**
    sensitivity of, **1468**
    tuning devices for, (**D**)**3503**
  communication, design of, (**D**)**1457**
    Marconi Type RG44, **3228**
    RECRO 451, **264**
    super-synchrodyne, **2340**
    testing of, **2298**, (**D**)**3470**
  design of, **1459**, for f.m., **244**, **245**, and noise theory, (**A**)**2596**
  double-diversity, 2-channel, single-sideband, **2598**
  effect of limiters and selectivity, **814**
  f.m., alignment of, **1137**
    design of, **244**, for v.h.f., **245**
    fremodyne, **2065**, (**A**)**2596**
    Harvey double superheterodyne, **246**
    i.f. design for, (**A**)**2596**
    impulse-noise transients in, **3505**
    performance tests for, (**A**)**1419**
    for railway radio, **309**
    squelch circuits for, **2601**
    station selection with, **1467**
  high-fidelity, **2336**, **3229**
  mains, with plate aerials, **1563**
  narrow-band f.m. adapter for, **1734**
  noise elimination circuit, **1487**
  noise factor measurement for, **1481**
  optimum frequency characteristics of, **1461**
  panoramic, 3.5–20 Mc/s, **2600**
  with plug-in circuits, **1136**, **2337**
  R.1147B, conversion for 50–250 Mc/s, **3227**
  radio, random noise in, **1483**
  R.C.A. AR-88D, 535 kc/s–32 Mc/s, **2335**
  sensitivity of, **3232**
  servicing manual for, (**B**)**2075**
  for single-sideband systems, **2395**
  superheterodyne, high-fidelity, **1135**
    multichannel, crystal control of, **2342**
    tracking in, charts for, **528**, formulae for, **3502**
    for 1.7–60 Mc/s, **1464**
    for 144 Mc/s, **810**
    characteristics of separately-quenched circuit, (**A**)**2596**
    post-war, (**A**)**2596**
    signal/noise ratio in, **1738**
    stabilization of, **3234**
    theory of, (**A**)**2596**, for linear mode, (**A**)**2596**, **3501**
    for 420 Mc/s, **1509**
  switch *vs* tone-control for, **1477**
  synchrodyne, (**D**)**1139**, **1140**
    design of, **525**, **526**, **1138**, (**A**)**2896**
    principle of, **3500**
    refinements and extensions, **1733**
  at 1948 Paris fair, **3231**
  for λ 2 m, Varif, **1470**
  for 30–180 Mc/s, design problems, **2761**
Reception, diversity, in California, **537**
    and directive, for broadcasting, **255**
  f.m., phase discriminator *vs* ratio detector, **2345**
  of signals through noise, **2603**
  single-sideband, **2597**
    single-signal adapter, **3230**
  superheterodyne, **811**
    of pulse signals, **1737**
  s.w., band spreading by double heterodyning, **2898**
    with commercial receiver, **523**
  u.s.w., (**B**)**2074**
Reciprocity theorem, in electromechanical systems, **969**, (**D**)**970**, generalized, **2168**
Recorders (See also Sound recorders)
  for atmospherics, operation threshold of, **2902**
  height, ionospheric, **2240**
  level, high-speed, S.A.C.M. Type 2128, **1080**
  for valve characteristics and resonance curves, **436**
  12-channel, **503**
Rectifiers (See also Detectors; Ignitrons)
  crystal, (**B**)**2968**, S.W., **687**, for measurements, **1770**
  exponential resistance law for, **1868**
  full-wave, design of, **73**
  Ge, forward current in, **3439**
  half-wave, ripple current in, **1508**
  Hg arc, h.v., (**D**)**561**, applications of, (**D**)**560**

        steel-bulb, 2372
    hot-cathode, Hg-vapour, 1208
    pulsed, for television receivers, 311
    Se, 1379, effect of bending, 86, small, 3253
    Si, Se and CuO, 3133
    thermionic, rating of, 599
    thyratron, control of, 2640, by shunt valve, 39
    voltage impulses in, 1286
Refraction, ionospheric, 2884
    tropospheric, solution of equations for, 2044
        and radio propagation, 1940
Regulation, voltage, in broadcasting stations, 1170
        for thyratron rectifiers, 2640
Regulator, voltage, electronic, 1764
        gas-valve, optimum operating conditions for, 563
        shunt, 3254
Relay station, at Tangier, 552
——**systems** (See also Communication systems; Radio links)
    cm-λ, for remote radar displays, 3519
    f.m., *vs* coaxial cable, for television, 2370
    microwave, 550, 1754
        abacs for calculation of, 2891
        New York/Boston, 1755, 1756, repeaters for, 2919, terminals for, 2920
        remodulating, 2917
    multiplex, with pulse-time modulation, 548
    television, London/Birmingham, 297
Relays, glass-sealed, reed, 562, (A)2375
    Hg-contact, 562, (A)2374
    r.f., for remote control, 280
    voice-controlled, 1502
Research, electrical, B.E.A.I.R.A. report for 1947, 2990
    industrial, (B)1527
    low-temperature, in North America, 1619
    radio, British, (B)320, 904
    telecommunications, at T.R.E., Great Malvern, 2678
Resin casting, for circuit stabilization, 442
Resistance comparison, at 3300 Mc/s, 1999
    meter, r.f., 3460
    of PbS at low temperatures, 85
    resonance- and loss-, measurement for oscillatory circuit, 1998
Resistors, film, operating characteristics of, (A)2763
    measurement of time constant, 166, 3453
    nonlinear, SiC, (D)3361
    nonmetallic, distortion in, 3362
    printed, (A)1614
    temperature-dependent, 666
Resonance, gyromagnetic, in ferrites, 135
    magnetic, relaxation effects, (A)131
    phenomena, solid diagrams for, 2481
Resonators, cavity, 975, 1304
        abacs for resonant frequencies of, 48
        application of perturbation method to, 2482
        coaxial, TE modes in, (D)372
        circuit equivalents of, 3050
        coupling through small aperture, 2197
        cylindrical, 366, in cascade, 2198
        design formulae for, 2743
        effect of electron beam on frequencies of, 2483
        for electron acceleration, 1431
        high-Q, 2196, measurement at 10000 Mc/s, 2282
        loading of, (A)682
        for microwave loss measurements, 765
        for 2300 Mc/s, 2199
        for ½-MV operation, (A)2475
    crystal, (Ba/Sr)TiO$_3$, 3138
        series trimming of, 363
        excitation of, 3334
        frequency stability of, 3369
        Helmholtz, correction formula for frequency of, 2998
Reverberation, optimum, basic time integral, 33[illegible]
    in the sea, 3290
    tests in broadcast studios, 930
Rhodium in engineering, 747
Rotation, speed measurement by use of WWV signals, 195
Rubber, accelerated aging tests, 3145
    effects of weather, 2831
    hard, synthetic, 2542
    silicone, properties and applications of, 2820
    synthetic, GR-S, 148, Hycar P.A., 3151

S

Salt solution, aqueous, dielectric properties of, 1915
Scattering, of sound by spheres and cylinders, 2120
Screening, magnetic, by spherical shell, 705
    of room for r.f., 2642
    at v.h.f., 2817
Screens (See also Cathode-ray screens)
    fluorescent, effect of X rays, 437
Sealing, hermetic, of transformers, 749
Seals, ceramic/metal, 120, 121
    glass/metal, 1972, stresses in, effect of temperature, 2799, use of Ti, (A)2800
    glass/tungsten, effect of heat treatment, 119
Selectivity of broadcast receivers, 3499
    calculations, abac for, 1335
    by negative feedback, 1465
Selenium crystals, conductivity of, 2809
Semiconductors, 1058
    ceramic, 752
    and crystal detectors, theory of, 87
    electrical behaviour of Te, 130
    electrical oscillations in Ge crystals, (A)138
    electronic, physics of, (A) 128
    excess-defect, Ge contacts, 1380
    resistivity and Hall effect at low temperature, (A)139
    with large negative temperature coefficient of resistance, [illegible]
    low-temperature resistivity of, (A)140
    photoconductive, as amplifiers, 3065
    physics of, 2264
    sintered, 1659
    thin films, effect of surface charges, 3438
Servicing, of f.m. and television receivers, (B)3076
    of receivers, most-often-needed 1947 diagrams, (B)256
Servomechanisms, for automatic boiler control, (A)829; data-transmission systems, (A)829; fundamentals of, (B)1177; I.E.E. convention papers, (A)829; performance measurement, (A)2639; in radio technique, 3252; theory of, 1762; variable-r.f.-follower system, 2088
Signal generators, for alignment of television receivers, 1415
    a.m./f.m., 2297, alignment of, 1091
    for cm λ, 2027
    for cm-λ noise-factor measurement, 2026
    with fixed carrier frequencies, 1696
    German, (B)3194
    p.m., for 260–800 Mc/s, 1697
    quartz-controlled, 1097
    RC-tuned, beat-frequency, 2599
    for testing television receivers, 775, 2388, picture-modulated, (A)2552, 3469
    u.h.f., wide-band sweep, 487
        wide-range, 776
    wide-band, for 10–100 Mc/s, 1698
    90 kc/s–210 Mc/s, 1416
    170 kc/s–15 Mc/s, 1098
    5–35 Mc/s and 35–82 Mc/s, with display, for amplifier alignment, 1695
Signal/noise ratio, in different systems, 1807; in l.f. amplifiers, 1320; in oscillographic receivers, 2070; in radar, (D) 1739
Signal tracer, and meter, 1099
    pocket, 1700
Silicones, as coatings for glass insulators, 746
        production and properties of, 1056
        uses of, 147
Sirens See Sound sources
Solar activity (See also Sun; Sunspots)
    chromospheric eruption 25th July 1946, 3107
    and critical frequencies, 727
    data for April–Sept. 1947, 1919
    effect on D-layer ionization, 413
    flares, 1356, July 1946, 1631
    and geomagnetic storms, 1630
    and ionosphere, 1629
    prominences, e.m. forces in, 414
    short-lived high-latitude flocculus, 97
    Swiss radio information service, 98
—— **atmosphere,** structure of, 2785
—— **corona,** effect on ionosphere during eclipse, 728
    theory of heating of, 2786
—— **eclipse,** 1st Oct. 1940, effect on ionosphere, 1924
    9th July 1945, Swedish ionospheric investigations, 1925
    20th May 1947, French radio observations, 1623, 1640
—— **magnetic field,** theories of, 3404
—— **noise** (See also Noise)
    fluctuations at r.f., and flares, 2512
    at 200 Mc/s, (A)1355
    at 600 and 1200 Mc/s, 3103
    at λ 10.7 cm, 2513
—— **radiation,** a.f., possible existence of, 1628
    microwave, 2229, enhanced, [illegible]
    and night-sky light, 1643
    r.f., 95, 2783, 2784, radar reception of, 1627, and sunspots, 412, 2228, theory of, 1026, at m λ, 1626, and cm λ, 1920, v.h.f., 711, at 80 and 175 Mc/s, 96, at 480 Mc/s, 1921
Soldering of Al alloys, 2827
Sonar, German counter-measures, 1107
Sound (See also Absorption; Acoustics; Noise)
    diffraction, by circular disks and apertures, 3294
        by infinite set of plates, 3295
        by rigid circular cones, 3296
    distribution systems, planning of, 2704
        with programme selection, 327
    films, analysis with photoelectric Fourier transformer, 2432
    high-frequency, audibility of, 3002
    intense, physiological effects of, 922, 1533
    measurement tanks, absorbent walls for, 3304
    pressure measurement at 50 c/s–250 kc/s, 3303
    quality, masking effect of periodically pulsed tones, 927
        phase effects, 925
        pitch discrimination in masking, 926
    radiation, from unflanged pipe, (A)628, 1845
    reflection, from coastal sea bottom, 2687
        by spherical shell, 2686
        of underwater sound at sea surface, 3293
    reinforcement, in the Hollywood Bowl, 1544
        for theatres, 2697
    sources, clamped-edge disk, 3288
        directivity index for, 3289
        linear arrays, (A)3292
        magnetostrictive radial vibrator, (A)2151
        siren, high-power, for 3–34 kc/s, 917, turbo-generator, 18-kW, 922, ultrasonic, 2433
    synthetic, on film, 2709
    transmission, by spherical shell, 2686
    velocity, interferometer for underwater measurement, (A)634
—— **propagation,** along infinite rectangular duct, 911
    mean free path in auditorium, 2
    reflection coefficient and phase change for porous materials, 3306
    reflection and transmission by thin curved shells, 912
    reverberation in the sea, 3290
    through simple vortex, 2121
    underwater, by bottom reflection, (A)2123, 3291
—— **recorders,** embossing, 942
    magnetic-tape, 329, 945, 3010
        construction of, 2154
        design of, 20
    magnetophon, 641, (B)2160
    portable recorder-player, 328
—— **recording,** 1545, 2441, 2706
    calibration of frequency records, (A)2430
    development of, 2153
    disk, (A)1243
        British and American technical developments, 624
        distortion in, 16
        f.m. calibrator for, 773, applications of, 774
        high-fidelity equipment for, 17
        increase of volume level in, 2707
        intermodulation distortion in, 630
        lacquer, cutting force for blank groove, 638
        noise modulation in, 1538
        stylus with multiple burnishing facets, 1234
    feedback head for, 1242
    on film, by engraving, 1546
        c.r.o. images of noise-reduction envelopes, 2150
        filmgraph system, 941
    light modulator for, 1853
    magnetic, 943
        bias-field distortion, (A)2430
        bibliography, 642, 944
        frequency response of, 19, and distortion in, 3332
        note location on magnetophon tape, 1852
        recording-head fields, 1244
        stereophonic, 1229, 3313
        theory of, 1851
        visual observation of patterns, (A)2430
        wire test characteristics, 3149
—— **reproducers,** magnetic tape, 945
    portable recorder-player, 328
—— **reproduction,** 1545, 2441, 2706
    artificial-reverberation system, 3320
    bass correction for, 18, 2708
    British Sound Recording Association discussion, (AD)1224
    development of, 2153
    disk, design of compensation networks, 2435
        distortion in, 16
        h.f. equalization for magnetic pickups, 631
        intermodulation distortion in, 630
        noise suppressor, dynamic, 932, 933, 1233, 2147, 2436, 2759, for needle scratch, 46, 1235, for surface noise, 2692
        record wear, analysis of, 2694
        volume expander for, 46
        wow meter, 2148, 3006, 3467
    film, filmgraph system, 941
        photoelectric, 1541
    listeners' frequency-range preference, 10, 11, 635, (D)934, 1237, 2695, 2696
    loudness control in, 3380
    magnetic, stereophonic, 1229, 3313
Space charge effect, in beam tetrodes, 2668
        on phase focusing of electron beams, 3568
        on thermionic emission, 872, (A)1825
        in microwave tetrodes, 880
        in valves, electrolyte tank for, 3179
Spark gaps, enclosed, for overvoltage protection, 832
    triggered, for high-power modulators, 833
Spectrometer, r.f., for λ 3 cm, 2017
Spectroscope, infra-red, with c.r. presentation, (D)493
        electronic eyepiece for, 3196
    microwave, 708
Spectrum, microwave, frequency markers for, 1353
        Stark effect, 1344
Speech intelligibility, in communication systems, 323; in deafness of loud noise, 2690; effect of small enclosures, 3315; effects of distortion, 1537, and filtering, 2688
    spectra, measurement of, 924
    transmission, new methods, 1228, (D)2139
    visible, (B)2713
    waveform analysis with audio spectrometer, 3316
Spraying technique for printed circuits, (A)1614
Stability criteria, for oscillatory systems, 1568
Stabilization, frequency, of microwave oscillators, 1311, 3055, by spectrum lines, 2180, (A)2475, 2953
        of reflex oscillators, 1569
    of superregenerative receiver, 3234
    voltage, of d.c. supplies, 564, (D)835
        by nonlinear resistors, 1169
        for power supplies, 1765, 2934
        for television apparatus, 1766
Stabilizers, voltage, a.c., 831
        d.c., h.v., with inductively coupled series valve, 3257
        effect of frequency variations, 3255
        e.m., 3256
        h.v., inductively coupled, degenerative, (A)278
        negative-current, 2930
        shunt, 2929
Standard frequency (See also Frequency)
    transmissions, from N.W. Germany broadcasting station, 3452
        from Royal Observatory, Abinger, 170
    transmitting centre, Turin, 1987
Standardization, 900
    of tuning units for 1948, in France, 3068
Standing-wave ratio, indicator for 3–22 Mc/s, 2300
    v.h.f. plotting device for, (A)2552
Statistics, application to electronic system design, (A)2677, 2992
Steels, cold-worked, low-loss, manufacture of, 137
Stethoscopes, industrial, 321
Storm location, direction finder for, 2527
    by radar, 433, 1963, 1964, 2254, quantitative analysis, (A)2524
Stratosphere chamber, 745
    survey, 1357
Strobes, automatic, 987
Studios, broadcasting, a.m./f.m. facilities at WOAI/WOAI-FM, 2924
        C.B.S. audio facilities, (A)2430, 3241
        design to minimize noise, 2437
        f.m., a.f. circuits for, 936
        installation planning, 825
        mobile, 1757
        pickup technique, 1539
        position of microphone for liveness, 12
        and recording, 1238
        reverberation tests in, 930
        sound measurements in, 3326
        sound reinforcement in, 1540
Sun, corpuscular discharge from, 1027
    a regular variable star, (A)94
    research on constitution and properties, 1354
Sunspots, (B)1954
    Alfvén's theory of, 2231, 3104, 3405, statistical tests of, 3105
    forecasting of, 99, 2232
    numbers, final, for 1946, 1922
        provisional, April–June 1947, 713, July–Sept. 1947, 1923
    and propagation forecasting, 3106
    and solar r.f. radiation, 412
    and telegraphy, 712
Superconductivity, theory of, (B)2509, 3084
Superconductors, NbN, r.f. resistance through transition point, 3135
    surface h.f. impedance of, 1014
Supersonics See Ultrasonics
Surveying, with pulsed light, 3211
Switches, cleaning of contacts, 1387
    electronic, cathode-coupled trigger, 357; cyclophon, 883; for single-aerial working, 2643; for amateur installations, 2376
    glass-sealed, 562
    multi-position, rectifier networks for, (A)2475
    stepping, for control applications, 2881; relay control circuits for, [illegible]
    thyratron, fast, noiseless, 3037
Symbols, and abbreviations, standard, (D)2426, (D)2427, (D)2428, (D)2676, (D)2991
Synchronization, automatic, of cyclotron, 2038
    of broadcasting networks, 260
    of low-power transmitters, 3272
    of oscillators, 1309, (B)2503
    phase, of remote television signals, 3260
    television, counter circuits for, 2472

T

Tantalum, in electronics, 440
Telecommunications, fundamental research problems of, (B)2995
    in war, 2114
Telecommunication systems, colonial, and equipment, 1150, (D)2907
        organization etc., 1149, (D)2907
Telecontrol, of missiles, 2324
    of tractor plough, 1131
    of receivers for aircraft communication, 275, 2636
Telemetry, design of a.m. subcarrier systems, 1989; design of precision equipment, (A)2574; fathom meter, 502; problems and solutions, 501; of water level, 1761
Telephone lines, short, frequency response of, 650
Telephony, arrangements for 5th Olympic Winter Sports, St. Moritz, [illegible], 3243
    British Post Office service, 2993
    carrier, multiplex, (A)2614
    long-distance, using vocoder, 2911
Teletypewriter, radio, using frequency-shift keying, 1493
Television, in America, 569
    British and American technical developments, 624
    cinephotography of images, 3263
    colorimetry in, 568
    colour, 1782
        F.C.C. decision, 293
        experimental simultaneous system, 572
    colour mixture and projective geometry, (A)2647, 3259
    d.c. component in, 2939
    effect of thunderstorms, 232
    e.m. sweep technique, 2092
    and films, 843
    framing-signal separation, 2386
    installation, 2091
    interconnection facilities for, 846
    interference, 3533
        from amateur transmissions, 579, 3537
        and frequency allocation, 538
        suppression of, 580, 3538
    large-picture, survey of methods, 2942
    line standard, in France, 294
        selection of, 2650
    modern, (B)1195
    modulation method for, 1788
    networks, F.C.C. conference on, 298
        interlocked scanning in, 1773
        land-line, for outside broacasts, 3536
        microwave transmission system for, 2653
    reception, tests, 1796
    reflection of signals from tall buildings, (A) 2647
    relay systems, 571
        London/Birmingham, 297
        microwave, New York/Schenectady, 1792
        New York/Philadelphia, 2921
        ship to shore station, 1784
    resolution chart, 1179
    stations, architectural design of, 582
        New York, field coverage of, (A)2647
    studio lighting, 1184
    studio technique, 1783
    synchronization, 2089
    systems, electro-optical characteristics of, 2940, 3261
        resolving power of, 1785

    sound on vision carrier, (D)2384
  techniques, (B)584
  for theatres, 2944
  underwater, 1779
  in U.S.S.R., 535
—— **apparatus**, aerials See Aerials, television
  for aircraft, 3264
  B.B.C., at Alexandra Palace, 2094
  cameras, C.P.S. emitron, 1775
    ériscope, 1776
    iconoscope, video storage by secondary emission, 836
    image orthicon, limiting resolution in, 2385
    improvements in, 291
    storage orthicon, and use for teleran, 1780
    and supply units for field use, 1506, 2389
    theory of, 1777, 1778
  c.r. tubes, chromoscope, 2937, 3531
    e.s. *vs* e.m. deflection for, 1192
    kinescope, magnetic deflection in, 573
    mass production of, 1505
    Type 5W (P15) for scanning, 3563
  deflector coil efficiency, 1181, 3535
  field equipment, 2938
  h.v. supply for c.r. tube, 286, 1182, 1183, 2390, (C)2947
  mobile equipment, 1789
  for outside broadcasts, 841, 1794
  packaged projection unit, 2943
  phase-synchronizing unit for remote video signals, 3260
  projection equipment, 301
  projectors, large-screen, 2941
  receivers, amplifier selectivity, 2951
    Bush Model T.91, 302
    construction of, 304, 1186, 1771, using BC-412 c.r.o., 303
    design of, 1187, and construction of, 1190
    detection and video amplification stages, 1189
    frequency-changing circuits, 1193
    h.f. video-amplifier correction, 1799
    home-built, 2391, 2392, high-quality, 577, (D)1796
    intercarrier sound system, 1188
    with MW31-6 c.r. tube, 1795
    projection, Philco, 578, Philips, 3266
    proposed standards for, 1191
    at Radiolympia, 1185
    R.C.A., Popular, 576, Type 630, 300
    spurious oscillations in, 3268
    tuner-amplifier for, (A)2647
    video, wide-band, 581
    visual alignment of, 192
    using war-surplus c.r. tube, 3267
  rectifiers, pulsed, for receivers, 311
  scanning generator and h.v. supply, 1774
  screens, multi-cell, French, 838
    white, and I.C.I. colour system, 570
  at station WABD, for special events, 2949
  synchronizing generator, 1781
    frequency stability of, 292
  test equipment See Test equipment
  timebase, 1791
  transmitters, design of, 1793, 1810, 2948, 3532
    power stage of, 575
    R.M.A. performance standards, 3265
  valves, c.r. tubes, rectifiers and stabilizers, 2965
  video amplifiers, l.f. correction of, 1194
—— **projection**, (A)2090
  basic principles of, 1786
  compact system, 2651
  correction plate for Schmidt system, calculation of, 2652
  c.r. tube supplies, 1787
  equipment for home, 2387
  large-screen, 1797, 2942, by use of eidophors, 296
  Philco system, 295
  plastic lenses for, 3154
Temperature gradient, in sea, measurement of, 1107
  low, phenomena at, 3385
  measurement, electronic instruments, 2869
Test equipment (See also Cathode-ray oscillographs; Servicing; Signal generators; Signal tracers; and individual subjects)
  impulse generator for 1.2 MV, 469, 1402
  for flexible waveguides, 1417
  magnetic, for hardness, 748
  for receivers, 163
  for television receivers, 780, signal generators, 775, 2388, with picture modulation, (A)2552, 3469
Testing, with circulated pulses, 777
  of communication receivers, 2298, (D)3470
  non-destructive, by ultrasonic resonance, 1112
  of radar responders, 781
Therapy, ultrasonic, 1709
Thermistors, in biological research, 500; properties of, 3036
Thermoelectric power, of ferromagnetic materials, 3090, of metals, 704, of CdO against Pt, 2266
Thickness measurement, for moving sheets, 2582; portable ultrasonic gauge, 1702; of sheet steel, using G-M β-ray counters, 497
Thoria, thermionic properties of, 141
Thunderstorms, effect on television, 232; electricity of, 1961
Time measurement, millisecond chronoscope for, 465
    portable electronic timer, 3165
    and recording, for μs intervals, 763
    with spiral-sweep c.r.o., 764
    for very short intervals, with chronotron, 762
  signals, continuous, National Bureau of Standards, quartz clock for, 2276
Timebase circuits, for c.r.o., 685
  generators, linear, and ranging circuits, 985
Timebases, linear, 2750
  Miller, reduction of fly-back time, 2749
  for radar range measurement, 2488
Titanium, use for glass/metal seals, (A)2800
Toroids, iron-core, design of, (A)2476
Towers, for aerials, design of, 35; microwave, portable, 2373
Transducers, in aircraft intercommunication systems, 2438
  electroacoustic, 2701
  electromechanical, theory of, 1849
  magnetostrictive, 100-kc/s, (A)3329
  resonator, equivalent circuit of, 679
  stepped-frequency, characteristics of, 2699
  underwater, 1542
Transformers, constant-voltage, for radio power supplies, 282, 1173
  design of, 38, for electronic circuits, (B)2221
  effective core permeability, calculation of, (A)41
  hermetic sealing for tropics, 749
  i.f., for a.m./f.m. receivers, 1732, for 10.7 Mc/s, 1284
  obvious and otherwise, 45
  output, a.f., 3034, efficiency of, 1407
  parallel-tuned, design of, 2177
  pulse, theory and design of, 1565, for high-power, 660
    calculation of constants, 661
  wide-band, from unbalanced to balanced line, 662
  λ/2, for impedance-matching, 3042
Transient response, in networks, adjustment of, (A)2475
  in waveguides and cavity resonators, 3019
Transients, a.f., visual analysis of, (A)2552
  impulse-noise, in f.m. receivers, 3505
  and nonlinear distortion, display of, 3183
Transmission, bandwidth reduction in, 3539
  single-sideband, phasing method for, 3271
  u.h.f., multipath, simulator for, (A)2552
—— **lines**, calculations, (D)1256
    by circle diagrams, 337
  chart for mismatch loss, 1557
  coaxial, delay, 1287
    non-contacting short-circuits for, 330, 643, 644
    plane discontinuities in, 1249
    spiral, theory of, 2715
    2-dielectric, propagation in, (A)2166
  compound, attenuation in, 1556
  design data, microwave, (B)3545
  exponential, as transformers, 672
    and uniform, 1258
  flat-plate, as v.h.f. reactors, 2477
  f.m. and television, installation equipment for, 1176, 2381
  h.v., fault location by radio methods, 2539
  long, theory of, 2444
  multiconductor, lossless, behaviour of, (A)2443
  non-uniform, input impedance of, 3339
  theory of, (B)1283, simplified, 3013
  vector diagram for, (A)2443
Transmitter-receivers (See also Communication, mobile)
  mobile, lightweight, 848
  TBY-7, for amateur use, 1159
  280–330 Mc/s, 308
Transmitters, (See also Broadcasting; Communication; Radar; Television)
  amateur, all-band, 1803; conversion of 150-B for 14 Mc/s, 589; duplex, R/T, for local operation, 307; midget, 35-W, 2954; mobile, crystal-controlled, for 144 Mc/s, 852, f.m., for λ 10 m, 1198, for 144 Mc/s, 2400; R/T and c.w., 75-W, 1802; R/T, miniature, for λ 10 m, 1508; single-band, 14-Mc/s, 1805; for 2- 6- and 10-m bands, 587; for 420 Mc/s, 1509; 350-W, for telephony and c.w., 588; 600-W R/T, 1199; 1-kW, 851, 1801
  broadcast, B.B.C. variable-frequency drive equipment, 1806
    f.m., 850; installation on mountain-top, 268; KSBR 50-kW, 592; master oscillator for, 2402; performance measurements for, 1694; using phasitron modulation, 591; v.h.f., 1-kW, 593; 50-kW, 2655, 2957
    harmonic suppression in, 2654
    h.f., variable-frequency, 2399
    high-power, parallel operation of, 3540
    50-W, Type TH.1163, 2096
    20-kW, Type TH.1392, 2956
  citizens'-band, 3511
  control systems for, 849
  dm-λ, development of, 856
  driver design for single-sideband systems, 2396
  marine, Trader and Oceanspan, 2397
  matching ranges of, 595, (C)2097, 2401
  for multichannel communication, 2955
  naval communication, frequency composition in, 2278
  in parallel, 3270
  portable, 460–470 Mc/s, for citizens' radio, 855
  pulsed, frequency instability of, 857
  radar, C.H., 853
    mobile, m-λ, 854
    survey of developments, 2095
  R/T, for shore stations, 1804
  stabilized, f.m./a.m., 586
  25-W, 60-Mc/s, 590
Transmitting station, radio, at Criggion, 2371
Tropics, deterioration of radio equipment in, 2815
  effect on plastics, 3153
Troposphere (See also Atmosphere)
  continuous sounding by radar, (A)2590, at 2.898 and 2800 Mc/s, 2593
  diurnal temperature variation of, 109
  refraction in, 1940
  structure and refractive index of, 1939
  and u.s.w. propagation, 2066
Tuners, a.m., superheterodyne, wide-band, 1472
  a.m./f.m., Collins, 2347
    design of, 236
  f.m., Browning RV-10, 3236
Tungsten, oxide films on, 743
Tuning devices, for broadcast receivers, (D)3503
    coil-pack modification, 1331
    inductive, for f.m. television receivers, 2069
    permeability, for broadcast receivers, 71
    wide range, for magnetrons, (A)2664
  indicator, c.r., 1837
    for f.m., 834
    magic eye, as polarity indicator, 2497
  of multiple-cavity magnetrons, 2417
  without capacitors, 389
—— **forks**, pressure/frequency effect, 627

U

Ultrasonic absorption, in liquids, 3, in water, 4
  applications, 1421; in biology, 2867; for blind guidance, (A)2573; in dentistry and metallurgy, 1704; depth sounding, modern equipment for, 2127; flaw detection, 1113; high-power, 3195; in industry, 2587; portable thickness gauge, 1702; soldering, 2827; in therapy, 1709
  cell, for modulation of light, 1847, distortion in, 3000
  field, coupling with infra-red radiation, (A)2574
    near diffracting edges, 3297
  interferometry, simplified theory of, (A)2430
  propagation, through Hg in tubes, 3298, in high polymers, 3442
  reflection, from sea bottom, (A)629
  research and properties of matter, 3300
  resonance, and non-destructive testing, 1112
  waves, distortion of, 2999, measurement of λ, 1846
Ultrasonics, interferometer for measuring velocity in liquids, 1226
  load problems in, 2304
  physiological effects of, (A)3299
  review and applications, 916
  velocity and absorption measurements in liquid mixtures, 2128
Units, dimensions and similitude, 2504
  electrical, conversion table for, 3451
    resolutions of International Committee of Weights and Measures, 1398
    systems of, 3077
  e.m., 75, (C)1008
  and e.m. formulae, rationalization of, 1006
  Giorgi system of, 1007

V

Vacuum gauges, hot-wire, 436
  plant, for continuous operation, (A)2663
  practice, manual of, (B)3157
  pumps, diffusion, theory of, 2257, 3126
    historical survey, 1371, 2534, principles and design of, 2256
Valves, all-stage, Sargrove-Tungsram UA55, 1203
  amplifier, beam-deflection control in, 881
    demagnetization to cure ripple, 3559
    grounded-grid, u.s.w., 882
    using secondary emission, 318
    wide-band, for cm λ, 1834
  anode dissipation measurement for, (A)188
  beam-tetrode, space-charge effects in, 2668
    Type 807, characteristics and circuits for, 1831
  beam tube for pulse-code modulation, 2411
  broadcasting, German, characteristics and data for, (B)3569
  characteristics, display on c.r.o., 772
    by extrapolation, 2105
    with 28-V supply, (A)1207
  design for hearing aids, (A)2430
  devices for assembly of, 867
  diode, as a.c. voltmeters, 767
    contact potential for negative bias of, 353
    plane, theory of, 2976, 2977
    standard for cathode core-material tests, (A)[illegible]
    total emission damping of, 3554
    transmission-line, as cm-λ noise source, 2073
  double-triode, miniature, 873
  dyotron, microwave oscillator, (A)2663, 2979
  electrode dissipation of, at u.h.f., 865
  electrometer, double, 1211
  failures in ENIAC, 601
  frequency-changer, international equivalents, 1821
  grid-controlled, oscillation-frequency limits of, 1819
  for industrial heating, design trends, 3275
  klystron, (B)61[illegible]
    reflector analysis for, 3567
    reflex, CV35, manufacture in Australia, 1519, electronic tuning of, 2110, multi-frequency bunching in, 2968, tuning band and output of, 2672, for λ 8–9 mm, 3277
    transit-time effect in gap, 898
    two-cavity, effects on space charge, 612
    use for amateur radio, 613
  letter symbols for, (B)869
  life statistics, exponential distribution in, 2836
  magnetron, a.m. of, (A)2663
    cavity, development of, 890, (D)3564
    c.w., wide-tuning-range, (A)2663
    effect of vacuum on frequency, 1517
    f.m. of, (A)2614
    low-power, cm-λ, 2987
    multiple-cavity, 1840, tuning of, 2417
    multi-segment, oscillation mechanism of, [illegible]
    oscillations with Lecher system, 1516
    pinhole radiography of, 2670
    pulsed, high-power, development of, 891, (D)3565; 892, (D)3566
    split-anode, effect of external e.m. field, 610
      wavelength laws of, 1515
    vane-type, theory of, 2871
    wide-range tuning systems for, (A)2663
  measurement of dynamic mutual conductance of, (D)1079
  microwave, oscillation excitation by electron streams, 2970
  miniature, 1002, 1206, Hivac, 2962
  new European, characteristics of, 2968
  with nonlinear characteristics, theory of, 2963
  oscillator, reflex, 611
  output, space-charge-grid, (A)868
  pentode, h.f., as electrometer valves, 3557
    with variable screen voltage, 1832
    6AS6G, characteristics of, 313
  phasitron frequency modulator, 1495
  p.m., high-vacuum oxide-cathode, 1209
  power, optimum load impedance for, 996
  processing of components during manufacture, (A)2663
  radial-beam, with e.s. focusing, (A)2663
  receiving, developments in France, 603, 2664
    for industrial use, (A)2663
    u.h.f., 2413
  rectifier, for high altitudes, 2659
    h.v., two-terminal, (A)2663
  reflection of electrons in, 2964
  regulator, gas-discharge, circuit design for, 2972
  rimlock and Mazda-medium, applications of, 3552
  rugged, 2966
  shot effect, in cylindrical diodes, 1829
    compensation of, 3358
  special, for television, 2965
  subminiature, 866
    British, 2410
    triode, microphony in, 3556
  technical developments in France, 1822
  for television receivers, performance of, 2971
  tetrode, beam, potential distribution in, 2109
    microwave, space-charge effects in, 880
    output, 608, space-charge, 2667
    transmitting, u.h.f., design of, 2981
  theory of, (B)3279
  thermionic emission from grids, (A)2663
  thyratron, capacitor discharge through, 3187
    control by shunt valve, 39
    Hg-vapour, for radar modulators, 879
    operation and applications of, 2108
    Type 5594, characteristics of, 313
  transmitting, air cooling for, 2673
    ATL and ATW series, 2967
    saturation curves of, 616
    s.w., 871
    triode, high-power, 876
  travelling-wave, effect of passive modes, 3548
    energy exchange in, theory of, 602
    theory of, 2103, 2962, (C)3274, 3549
    use for v.h.f. amplification, 66
    wave properties in, 2409
  trigger, secondary-emission, NU TR-1032-J, (A)2663
  triode, a.c. operated, 2960
    interelectrode capacitances of, at u.h.f., 1830
    lighthouse, characteristics of, at 3000 Mc/s, 878
    limiting frequency of, 2665
    microwave, and klystrons, (B)3570
    positive-grid characteristics of, 3555
    for pulse output of 200 kW at 600 Mc/s, 2666
    u.s.w., 683
    v.h.f., dimensional analysis of, 2978
     virtual, 1607
     for 600 Mc/s, 877
  triode-hexode, ECH-35, 1512
  trochotron, 1205
  Types 38, 954 and 959, characteristics of, 1673
  u.s.w., and circuits, 2412
  VCH11 and VF14, characteristics of, 1818
  v.m., 895
    phase focusing in, 3568
    reflex, for radar, 1518, theory of, 614, for λ 10 cm, 897
    theory of, 894
    use as u.h.f. amplifiers, 1890
  war-time development of, 2101
Velodyne, and applications, 962
Vibration reduction, properties of felt, 929
  thickness/shear, of thin anisotropic plates, 3384
Vibrators, for conversion of d.c. to a.c., 1168
  servicing methods for, 2379
Vocoder, for long-distance telephony, 2911
Voltage measurement, at cm λ, 2007
  peak, measurement by electron diffraction, 165
    measurement at 600 Mc/s, 2286
Voltages, out-of-phase, generation of, 2738
Volt-ammeters, d.c., 2572
Voltmeters, a.c., diode, 767
  crystal, h.f., 2284
  diode, impulse response of, 2736
  electronic, a.c./d.c., multi-range, 1100
  ellipsoid, for high a.c. voltages, (C)478, (D)2849
  loading of, abac for, 766
  stable, 2847
  tetrode, for high negative voltages, 2285
  valve, 477, (D)1066, 2572
    bridge balanced amplifiers for, 2494
    d.c., 2008, with amplifier, 3178
    inverted, 2848
    pocket, 1687
Voltohmmeter, 1686
Volume expansion, surgeless, 2739

W

Watches, rate measurement, 1669, with c.r.o., 2838
Water, dielectric properties at cm λ, 1912, 1913, 1914
  vapour, dielectric properties at u.h.f., 1996
Wattmeters, calorimeter, u.h.f., coaxial load for, 174
  microwave, sources of error in, 3466
Wave mechanics, frequency and phase velocity of plane wave, 76
—— **propagation** (See also Acoustics; Sound)

acoustic, along boundary, [illegible]
—— **propagation, e.m.** (See also Electromagnetic theory; Ionosphere; Microwaves; Television)
in amateur frequency bands, 1449, 1452
anomalous conditions near New Zealand, 1969
in atmospheric ducts, 2329
and in waveguides, 1719
and Chernikov's effect, 1132
cm-λ technique and measuring apparatus, 2028
critical frequency forecasting, 419
curves for atmosphere with arbitrary refractive-index profile, [illegible]
along earth's surface, 1444, 1721
elementary manual, (B)3498
equivalent path and absorption for oblique incidence, 3493
field near cusp of caustic, 225
field of dipole near horizon, 224, 1443
field-strength, formula for long waves, 1448
in interference region, 226
of sky-wave signals, 778
over spherical earth, 800
frequency changes during propagation, 1723, 1725, 2052
through ground, (A)2590
gyro-interaction in, 2055
h.f. echo signals, 3495
beyond horizon, 803
horizontal angle-of-arrival measurements for λ 3.2 cm, 3225
and impedance concept, (D)3491
along infinite dielectric cylinders at l.f., 1352
intensity-distance law of radiation, 2592, 3492
ionospheric, 1442, (B)3226
and ionospheric anisotropy, 513, 1032
and ionospheric conditions, 2048
and ionospheric winds, 1726
over land, 2063
at cm λ, 519
long-distance, 1446
using 1 W at 7 Mc/s, 1452
in lower troposphere, 801
microwave, 2894
over water, forecasting of, 2330, refraction at λ 10 cm, 1134, vertical distribution of field strength, 2058
m.u.f. forecasts, 229, 1447, 2886, 2887
m.u.f. observations, 228
along non-uniform cable, 1549
optimum transmission frequency forecasting, 515
and planning of s.w. communication, 2050
in polar regions, and geomagnetism, 729
predictions for 1948, 1360
pulse reflection from ionosphere, 420
rebound scattering from F_2 layer at λ 10 m, 520
reflection from lower atmosphere, theory of, 801, (A)2590
restricted-range transmission, 3220
spherical waves from plane boundary, 2773
for stratified medium, normal-mode theory, 3223
and sunspots, 2604, 3106
s.w., round the earth, 2053, 2889, 3214, 3216, 3489, 3495, 3496
field calculation, 514
and temperature inversions, 3490
tropospheric, solution of refraction equations, 2044
u.s.w., 1450, 1727, 2056, (D)2331
meteorological effects, 1453, 1943, 2060, 2061
effects of obstacles, 2890
v.h.f., 3224
reflection from meteor trails, 2328
in viscous medium, 1016
war-time work of I.R.P.L., 2049
at λ 3 cm and λ 9 cm in low ocean ducts, 521
at λ ⩽10 m, 802
at 47.1, 106.5 and 700 Mc/s, 2892
at 40–100 Mc/s, 1478
near 50 Mc/s, 1451
Waveform, trapezoidal, with minimal noise factor, 2470
—— **analysis**, at low a.f., using c.r. tube, 5
for a.f. transients, (A)2552
c.r. equipment for, 479, (D)480
for modulated light beam, 1087
potentiometer method, 3171
of pulse-lengthener output, 667
Waveguides, admittance matching with irises, 649
anomalous attenuation in, 2446
attenuators for, 1892
broad-band junctions with coaxial lines, 335
and cavity resonators, transient state in, 3019
circular, with coaxial dielectrics, field components of, 22
cylindrical, propagation in, 334, 1554, 1555, 2723
design data, (B)3545
diaphragms in, propagation through, 1252
directional couplers for, 1855, (D)2719
discontinuities in, 3020
disk-loaded, theory of, 1253
effect of junctions on field in, 3018
excitation of, 3334, 3335
H waves near limiting frequency, 333
hybrid junctions for, 2163, 2165
hybrid rings for microwaves, (A)2443
light-weight, 755
losses in, calculation of, 949
and microwaves, (B)1564
nearly circular, propagation in, 2724
non-metallic, fields in, (A)2443
open-ended, plane, 3336, 3337
oval, properties and applications of, 2720
perturbation propagation in, 2447
phase-changer for, 1255
principles and practice of, (B)350
propagation in, 1251, 1719
properties of, 2445
with radiating slits, 2164
rectangular, attenuation of H_{10} waves, 3016
equivalent circuit of bend in, 648
excitation through slot, 3017
geometry of, 2722
matrix theory for reflections from circular bends, 2721
ridge, geometry for, (A)2443, properties of, 23
ring resonant slot in, 3021
standing-wave indicators for, 3468
test gear for, 1417
theory for plane waves, 1553
transmitter-blocker cells for cm waves, 1768
u.h.f. modulation in, 54
λ/4-coupled filters for, 1000
Wavemeters, for cm λ, 3465
absorption, for dm λ, 3464
for 120–500 Mc/s, 1692
for 250–850 Mc/s, 1691
cm-λ, direct reading, 2018, 2293
microwave, calibration of, 485
resonance, for 10000–25000 Mc/s, 2019
sensitive, 186
Waves, e.m., diffraction of, 2326
and electrons, interaction of, 3093
interaction of, 3219
magneto-ionic splitting, by E layer, 2051
triple, by F layer, 2595, 3222, in polar regions, 2594, 3221
of phase velocity *c*, structure of, 2718
spherical, theory of, 3094
u.h.f., properties and applications of, 1911
velocity of, 1720
measurement, in atmosphere, 1438, by cavity resonator, 3488, over land at 100 kc/s, 1440, over sea water for cm λ, 1441
Whistles, h.f., and edge tones and resonance, (A)2129
Wire, enamelled, test apparatus for, 1676
Wobbulator, wide-band, 1310

X

X-ray applications, study of surface layers, 1055, thickness gauge, 2302
—— **tubes**, with line focus, 217
rotating-anode, peristron, 3485
X rays, image-intensification tube for, 3562
recent progress in production of, 2876

ERRATA

In "Abstracts and References" throughout the year.

Abstract No.	159	U.D.C. should read 621.314.3† : 518.5
,, ,,	489	Cancel initial M before Chamagne
,, ,,	602	For A. Doehler read O. Doehler
,, ,,	1194	For S. Royer read J. Royer
,, ,,	1388	For Kilomiets read Kolomiets
,, ,,	2303	For J. J. Hickey read J. S. Hickey
,, ,,	2371	U.D.C. should read 621.396.7
,, ,,	2698	For L. Camp read L. W. Camp
,, ,,	2865	For " Volume 2 of the Radiation Laboratory series " read " Volume 11 . . ."
,, ,,	2963	For " noise factor " read " distortion " in both text and title, and delete comma after " anode current " in title
,, ,,	3501	U.D.C. should read 621.396.021

LIST OF JOURNALS

A selection of the journals which are regularly scanned is given below, together with the addresses of publishers or editorial offices and the abbreviations of titles as used in the Abstracts and References. Applications for copies of any journal should be made to the addresses given.

The full title of each journal is given first and is followed by the address, the abbreviated title being shown within parentheses. In a few cases the nature of a journal is indicated, where neither the title nor the address shows it clearly.

A

Alta Frequenza, Associazione Elettrotecnica Italiana, Torino (116), Corso Massimo d' Azeglio, 42, Italy. (*Alta Frequenza*)

American Journal of Roentgenology, Charles C. Thomas, Springfield, Illinois, U.S.A. (*Amer. J. Roentgenol.*)

American Journal of Science, New Haven, Connecticut, U.S.A. (*Amer. J. Sci.*)

Annales de Géophysique, 165, rue de Sèvres, Paris XV^e^, France. (*Ann. Géophys.*)

Annales de Physique, Masson & Cie, 120, Boulevard Saint-Germain, Paris VI^e^, France. (*Ann. Phys., Paris*)

Annales de Radioélectricité, 98 bis, Boulevard Hausmann, Paris VIII^e^, France. (*Ann. Radioélect.*)

Applied Scientific Research, Martinus Nijhoff, The Hague, Holland. (*Appl. sci. Res.*)

Archiv der elektrischen Übertragung, Dieterich'sche Verlagsbuchhandlung, Inh. W. Klemm, Wiesbaden, Spiegelgasse 9, Germany. (*Arch. elekt. Ubertragung*)

Archiv für technisches Messen, Ernst Ludwig Buchhandlung, München, Karlsplatz 7, Germany. (*Arch. tech. Messen*)

Arkiv för Matematik Astronomi och Fysik, published for Royal Swedish Academy of Sciences by Almqvist & Wiksells Boktryckeri A.-B., Stockholm, Sweden. (*Ark. Mat. Astr. Fys.*)

A.S.T.M. Bulletin, Journal of the American Society for Testing Materials; 20th and Northampton Streets, Easton, Pennsylvania, U.S.A. (*A.S.T.M. Bull.*)

Astrophysical Journal, The University of Chicago Press, Chicago 37, Illinois, U.S.A. (*Astrophys. J.*)

Audio Engineering (formerly **Radio**), Radio Magazines, Inc., 28, Renne Avenue, Pittsfield, Massachusetts, U.S.A. (*Audio Engng, N.Y.*)

Australian Journal of Instrument Technology, 414, Collins St., Melbourne, Australia. (*Aust. J. Instrum. Tech.*)

Avtomatika i Telemekhanika, Academy of Sciences, U.S.S.R. (*Avtomatika i Telemekhanika*)

A.W.A. Technical Review, Amalgamated Wireless (Australasia), Ltd., Sydney, Australia. (*A.W.A. tech. Rev.*)

B

B.B.C. Quarterly, The British Broadcasting Corporation, The Grammar School, Searle Road, Wembley, Middlesex, England. (*B.B.C. Quart.*)

Beama Journal, The British Electrical and Allied Manufacturers' Association (Inc.), 36, Kingsway, London, W.C.2, England. (*Beama J.*)

Bell Laboratories Record, 463, West Street, New York 14, N.Y., U.S.A. (*Bell Lab. Rec.*)

Bell System Technical Journal, American Telephone and Telegraph Company, 195, Broadway, New York, N.Y., U.S.A. (*Bell Syst. tech. J.*)

British Journal of Radiology, 32, Welbeck St., London, W.1, England. (*Brit. J. Radiol.*)

British Medical Journal, British Medical Association, Tavistock Square, London, W.C.1, England. (*Brit. med. J.*)

British Standards Institution Monthly Information Sheet, 24/28, Victoria Street, London, S.W.1, England. (*Brit. Stand. Instn Mon. Inform. Sheet*)

Brown Boveri Review, Artillery Mansions, 75, Victoria Street, London, S.W.1, England. (*Brown Boveri Rev.*)

Bulletin de l'Académie des Sciences de l'U.R.S.S., (a) **série physique,** (b) **série géographique et géophysique,** (c) **classe sciences techniques,** Academy of Sciences, U.S.S.R. (*Bull. Acad. Sci. U.R.S.S., (a) sér. phys., (b) sér. géogr. géophys,* (In Russian.) *(c) tech. Sci.*)

Bulletin of the American Meteorological Society, Prince and Lemon Streets, Lancaster, Pennsylvania. (*Bull. Amer. met. Soc.*)

Bulletin de l'École polytechnique de Jassy, M. le Prof. D.I. Mangeron, Directeur du Séminaire Mathématique de l'École Polytechnique de Jassy, Jassy—Iasi, Roumania. (*Bull. Éc. polyt. Jassy*)

Bulletin Scientifique de l'Association des Ingénieurs Électriciens Sortis de l'Institut Électrotechnique Montefiore, Rue Saint-Gilles, 31, Liège, Belgium. (*Bull. sci. Ass. Inst. Montefiore*)

Bulletin de la Société française des Électriciens, 8–14, Avenue Pierre-Larousse, Malakoff (Seine), France. (*Bull. Soc. franç. Élect.*)

C

CQ, Radio Magazines, Inc., 342, Madison Avenue, New York 17, N.Y., U.S.A. (*CQ*)

Câbles et Transmission, Société mixte pour le développement de la technique des télécommunications sur câbles, 20, Avenue de Ségur, Paris VII^e^, France. (*Câbles & Transmission, Paris*)

Canadian Journal of Research (Sections A, B, and F), National Research Council, Ottawa, Canada. (*Canad. J. Res.*)

Chalmers tekniska Högskolas Handlingar, (Transactions of Chalmers University of Technology), N. J. Gumperts Bokhandel, Göteborg, Sweden. (*Chalmers tekn. Högsk. Handl.*)

Chinese Journal of Physics, J. S. Wang (Ed.), Department of Physics, National Tsing Hua University, Peiping, China. (*Chin. J. Phys.*)

Communications, Bryan Davis Publishing Co. Inc., 52, Vanderbilt Avenue, New York 17, N.Y., U.S.A. (*Communications*)

Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences, Gauthier-Villars, Quai des Grands-Augustins, Paris. (*C. R. Acad. Sci., Paris*)

Comptes Rendus (Doklady) de l'Académie des Sciences de l'U.R.S.S., Academy of Sciences, Moscow, U.S.S.R. (In Russian.) (*C. R. Acad. Sci. U.R.S.S.*)

Current Science, The Current Science Association, Bangalore, S. India. (*Curr. Sci.*)

D

Distribution of Electricity, 51/53, Hatton Garden, London, E.C.1, England. (*Distrib. Elect.*)

E

Electrical Communication, International Telephone and Telegraph Corporation, 67, Broad Street, New York 4, N.Y., U.S.A. (*Elect. Commun.*)

Electrical Engineering, Journal of the American Institute of Electrical Engineers; 20th and Northampton Streets, Easton, Pennsylvania, U.S.A. (*Elect. Engng, N.Y.*)

Electrical Review, Dorset House, Stamford Street, London, S.E.1, England. (*Elect. Rev., Lond.*)

Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, England. (*Elect. Times*)

Electrician, Bouverie House, 154, Fleet Street, London, E.C.4, England. (*Electrician*)

Electronic Engineering, 28, Essex St., Strand, London, W.C.2, England. (*Electronic Engng*)

Electronic Industries, Caldwell-Clements Inc., 480, Lexington Avenue, New York 17, N.Y., U.S.A. (*Electronic Industr.*)

Electronics, 99–129, North Broadway, Albany 1, N.Y., U.S.A. (*Electronics*)

Electrotechnics, Indian Institute of Science, Bangalore, S. India. (*Electrotechnics*)

Das Elektron, Ing. Hugo Kirnbauer (Ed.), Linz, Landstrasse 9, Austria. (*Elektron, Linz*)

Das Elektron in Wissenschaft und Technik, Gustav Büscher (Ed.), Hanns Reich Verlag, München 23, Martinsstrasse 8, Germany. (*Elektron Wiss. Tech.*)

Elektrotechnik (Wissenschaftliche Zeitschrift für die Gesamte Elektrotechnik), Berlin, N.W.7, Dorotheenstrasse 41, Germany. (*Elektrotechnik, Berlin*)

Elektrotechnik und Maschinenbau, Elektrotechnischer Verein Österreichs, Springer Verlag, Wien I, Mölkerbastei 5, Austria. (*Elektrotech. u. Maschinenb.*)

Elektrotechnika, Official organ of the Hungarian Electrotechnical Associa-

tion Budapest V, Honvéd-utca 22, Hungary. (*Elektrotechnika, Budapest*)
Elettronica, Torina, Corso G. Matteotti, 46, Italy. (*Elettronica, Turin*)
Endeavour, Imperial Chemical Industries, London, S.W.1, England. (*Endeavour*)
Engineer, 28, Essex Street, Strand, London, W.C.2, England. (*Engineer, Lond.*)
Engineering, 35 & 36, Bedford Street, Strand, London, W.C.2, England. (*Engineering, Lond.*)
Ericsson Review, Stockholm 32, Sweden. (*Ericsson Rev.*)
Ericsson Technics, Telefonaktiebolaget L. M. Ericsson, Stockholm, Sweden. (*Ericsson Technics*)

F

Fernmeldetechnische Zeitschrift, Friedrich Vieweg und Sohn, Braunschweig, Germany. (*Fernmeldetech. Z.*)
F.M. and Television, F.M. Company, 264, Main Street, Great Barrington, Massachusetts, U.S.A. (*FM & Televis.*)
Frequenz, Schiele & Schön, Berlin S.O.36, Schröderdamm 13, Germany. (*Frequenz*)
Funk und Ton, Verlag für Radio-Foto-Kinotechnik G.m.b.H., Berlin, N.65, Glasgowerstrasse 2, Germany. (*Funk u. Ton*)

G

G.E.C. Journal, The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2, England. (*G.E.C. J.*)
General Electric Review, General Electric Company, 1, River Road, Schenectady 5, N.Y., U.S.A. (*Gen. elect. Rev.*)
General Radio Experimenter, General Radio Company, Cambridge, Massachusetts, U.S.A. (*Gen. Radio Exp.*)
Génie Civil, 6, rue Jules-Lefevre, Paris IX^e^, France. (*Génie civ.*)
Geophysics, Journal of the Society of Exploration Geophysicists; M. King Hubbert (Ed.), Shell Oil Co., P.O. Box 2099, Houston 1, Texas, U.S.A. (*Geophys.*)
Glass Industry, Ogden Publishing Company, 55, West 42nd Street, New York 18, N.Y., U.S.A. (*Glass Ind.*)
Government Publications, H.M. Stationery Office, York House, Kingsway, London, W.C.2, England. (*Govt. Publ., Lond.*)

H

Helvetica Physica Acta, Journal of the Société Suisse de Physique; Editions Birkhäuser S.A., Basel, Switzerland. (*Helv. phys. Acta*)

I

Illuminating Engineering, 51, Madison Avenue, New York 10, N.Y., U.S.A. (*Illum. Engng, N.Y.*)
Indian Journal of Physics (and **Proceedings of the Indian Association for the Cultivation of Science**), 210, Bowbazer Street, Calcutta, India. (*Indian J. Phys.*)
Industrial and Engineering Chemistry, American Chemical Society, 1155, 16th Street N.W., Washington, 6, D.C., U.S.A. (*Industr. Engng Chem.*)
Instruments, 1117, Wolfendale Street, Pittsburgh, 12, Pennsylvania, U.S.A. (*Instruments*)

J

Journal of the Acoustical Society of America, Prince and Lemon Streets, Lancaster, Pennsylvania, U.S.A. (*J. acoust. Soc. Amer.*)
Journal of the American Ceramic Society (including **Ceramic Abstracts**), 20th and Northampton Streets, Easton, Pennsylvania, U.S.A. (*J. Amer. ceram. Soc.*)
Journal of Applied Physics, Prince and Lemon Streets, Lancaster, Pennsylvania, U.S.A. (*J. appl. Phys.*)
Journal of the British Institution of Radio Engineers, 9, Bedford Square, London, W.C.1., England. (*J. Brit. Instn Radio Engrs*)
Journal of Chemical Physics, American Institute of Physics, 57, East 55th Street, New York 22, N.Y., U.S.A. (*J. chem. Phys.*)
Journal of the Franklin Institute, Prince and Lemon Streets, Lancaster, Pennsylvania, U.S.A. (*J. Franklin Inst.*)
Journal of the Institute of Navigation, c/o Royal Geographical Society, 1, Kensington Gore, London, S.W.7, England. (*J. Inst. Nav.*)
Journal of the Institution of Civil Engineers, Great George Street, London, S.W.1, England. (*J. Instn civil Engrs*)
Journal of the Institution of Electrical Engineers (Part I: General, Part II: Power Engineering, Part III: Radio and Communication Engineering), Savoy Place, Victoria Embankment, London, W.C.2, England. (*J. Instn elect. Engrs*)
Journal of the Institution of Engineers, Australia, Science House, Gloucester and Essex Streets, Sydney, Australia. (*J. Instn Engrs Aust.*)
Journal of Mathematics and Physics, The Technology Press, Massachusetts Institute of Technology, Cambridge, 39, Massachusetts, U.S.A. (*J. Math. Phys.*)
Journal of the Optical Society of America, Prince and Lemon Streets, Lancaster, Pennsylvania, U.S.A. (*J. opt. Soc. Amer.*)
Journal de Physique et le Radium, 12, Place de Laborde, Paris VIII^e^, France. (*J. Phys. Radium*)
Journal of Research of the National Bureau of Standards, U.S. Government Printing Office, Washington 25, D.C., U.S.A. (*Bur. Stand. J. Res.*)
Journal of the Royal Aeronautical Society, 4, Hamilton Place, Piccadilly, London, W.1, England. (*J.R. aero. Soc.*)
Journal of the Royal Microscopical Society, B.M.A. House, Tavistock Square, London, W.C.1, England. (*J.R. micr. Soc.*)
Journal of the Royal Society of Arts, York House, Portugal Street, London, W.C.2, England. (*J.R. Soc. Arts*)
Journal and Proceedings of the Royal Society of New South Wales, Science House, Gloucester and Essex Streets, Sydney, Australia. (*J. roy. Soc. N.S.W.*)
Journal of Scientific Instruments, The Institute of Physics, 47, Belgrave Square, London, S.W.1, England. (*J. sci. Instrum.*)
Journal of the Society of Chemical Industry, 56, Victoria Street, London, S.W.1, England. (*J. Soc. chem. Ind., Lond.*)
Journal of the Society of Glass Technology, Prof. W. E. S. Turner, O.B.E., D.Sc., F.R.S. (Secretary), Northumberland Road, Sheffield 10, England. (*J. Soc. Glass Tech.*)
Journal of the Society of Motion Picture Engineers, Hotel Pennsylvania, New York 1, N.Y., U.S.A. (*J. Soc. Mot. Pict. Engrs*)
Journal of the Television Society, G. Parr (Ed.), 68, Compton Road, London, N.21, England. (*J. Televis. Soc.*)

L

Light and Lighting, The Illuminating Engineering Society, 32, Victoria Street, London, S.W.1, England. (*Light & Lighting*)
Light Metals, Bowling Green Lane, London, E.C.1, England. (*Light Metals*)

M

Machinery, National House, West Street, Brighton, 1, England. (*Machinery, Lond.*)
Machinery, The Industrial Press, 148, Lafayette Street, New York 13, N.Y., U.S.A. (*Machinery, N.Y.*)
Marconi Review, Electra House, Victoria Embankment, London, W.C.2, England. (*Marconi Rev.*)
Materials and Methods (formerly **Metals and Alloys**), Reinhold Publishing Corporation, 330, West 42nd Street, New York 18, N.Y., U.S.A. (*Materials & Methods*)
Metal Industry, The Louis Cassier Co., Ltd., Dorset House, Stamford Street, London, S.E.1, England. (*Metal Ind., Lond.*)
Metal Treatment, 49, Wellington Street, Strand, London, W.C.2. (*Metal Treatm.*)
Metallurgia [of Manchester], The Kennedy Press, Ltd., Bedford Street, London, W.C.2, England. (*Metallurgia, Manchr*)
Metals Technology, The American Institute of Mining and Metallurgical Engineers, Inc., 212, York Street, York, Pennsylvania, U.S.A. (*Metals Technol.*)
Modern Plastics, 122, East 42nd Street, New York 17, N.Y., U.S.A. (*Mod. Plast.*)
Monthly Notices of the Royal Astronomical Society, Burlington House, London, W.1, England. (*Mon. Not. R. astr. Soc.*)
Muirhead Technique, Muirhead & Co., Ltd., Beckenham, Kent, England. (*Muirhead Technique*)

N

Nature, Macmillan & Co., Ltd., St. Martin's Street, London, W.C.2, England. (*Nature, Lond.*)
Notices and Proceedings of the Royal Institution, 21, Albemarle Street, London, W.1, England. (*Not. Proc. roy. Instn*)
New Zealand Journal of Science and Technology, Government Printer, Wellington, New Zealand. (*N.Z. J. Sci. Tech.*)
Nickel Bulletin, The Mond Nickel Co. Ltd., Grosvenor House, Park Lane, London, W.1, England. (*Nickel Bull.*)
Il Nuovo Cimento, Nicola Zanichelli, Bologna, Italy. (*Nuovo Cim.*)

O

Observatory, Royal Observatory, Greenwich, London, S.E.10, England. (*Observatory*)
Onde électrique, La Société des Radioélectriciens, 40, Rue de la Seine, Paris VI^e^, France. (*Onde élect.*)
Oscillographer, Allen B. DuMont Laboratories, Clifton, New Jersey, U.S.A. (*Oscillographer*)
Overseas Engineer, Bowling Green Lane, London, E.C.1, England. (*Overseas Engr*)

P

Philips Research Reports, Research Laboratory, N.V. Philips Gloeilampenfabrieken, Eindhoven, Holland. (*Philips Res. Rep.*)
Philips Technical Communication, Philips Electrical Industries of Australia Pty. Ltd, 69, Clarence Street, Sydney, Australia. (*Philips tech. Commun. Aust.*)
Philips Technical Review (as for **Philips Research Reports**). (*Philips tech. Rev.*)
Philosophical Magazine, Taylor & Francis Ltd, Red Lion Court, Fleet Street, London, E.C.4, England. (*Phil. Mag.*)
Philosophical Transactions of the Royal Society of London, The Cambridge University Press, Bentley House, London, N.W.1, England. (*Philos. Trans.*)
Physica, Journal of the Dutch Physical Society, Martinus Nijhoff, The Hague, Holland. (*Physica, 's Grav.*)
Physical Review, Prince and Lemon Streets, Lancaster, Pennsylvania, U.S.A. (*Phys. Rev.*)
Physikalische Blätter, Verlag Volk und Zeit, Karlsruhe, Germany. (*Phys. Blätter*)
Post Office Electrical Engineers' Journal, Engineer-in-Chief's Office, Alder House, Aldersgate Street, London, E.C.1, England. (*P.O. elect. Engrs' J.*)
Poste e Telecomunicazioni, l'Instituto Superiore P.T., Viale Trastevere 189, Roma, Italy (Journal of Italian Post Office). (*Poste e Telecomunicazioni*)
Priroda, Academy of Sciences, U.S.S.R. (*Priroda*)
Proceedings Koninklijke Nederland Akademie van Wetenschappen, The North Holland Publishing Company, Amsterdam, Holland. (*Proc. Acad. Sci., Amst.*)
Proceedings of the Cambridge Philosophical Society, The Cambridge University Press, Bentley House, London, N.W.1, England. (*Proc. Camb. phil. Soc.*)
Proceedings of the Institute of Radio Engineers (and **Waves and Electrons**), 1, East 79th Street, New York 21, N.Y., U.S.A. (*Proc. Inst. Radio Engrs, W. & E.*)
Proceedings of the Institution of Mechanical Engineers, Storey's Gate, St. James' Park, London, S.W.1, England. (*Proc. Instn mech. Engrs, Lond.*)
Proceedings of the Institution of Radio Engineers, Australia, 146, Foveaux Street, Sydney, Australia. (*Proc. Inst. Radio Engrs, Aust.*)
Proceedings of the National Electronics Conference, Chicago, Dr. R. R. Buss (Secretary), c/o Electrical Engineering Department, Northwestern University, Chicago, Illinois, U.S.A. (*Proc. nat. Electronics Conference, Chicago*)
Proceedings of the Physical Society, 1, Lowther Gardens, Prince Consort Road, London, S.W.7, England. (*Proc. phys. Soc.*)
Proceedings of the Radio Club of America, 11, West 42nd Street, New York City, N.Y., U.S.A. (*Proc. Radio Cl. Amer.*)
Proceedings of the Royal Society (**Series A and B**), Cambridge University Press, Bentley House, London, N.W.1, England. (*Proc. roy. Soc.*)

Q

QST, The American Radio Relay League, Inc., 38, La Salle Road, West Hartford 7, Connecticut, U.S.A. (*QST*)
Quarterly of Applied Mathematics, 450, Ahnaip Street, Menasha, Wisconsin, U.S.A. (*Quart. appl. Math.*)
Quarterly Journal of Mechanics and Applied Mathematics, Clarendon Press, Oxford, England, *or* Geoffrey Cumberlege, Oxford University Press, Amen House, London, E.C.4, England. (*Quart. J. Mech. appl. Math.*)
Quarterly Journal of the Royal Meteorological Society, 49, Cromwell Road, London, S.W.7, England. (*Quart. J. R. met. Soc.*)

R

RCA Review, Radio Corporation of America, RCA Laboratories Division, 30, Rockefeller Plaza, New York 20, N.Y., U.S.A. (*RCA Rev.*)
R.S.G.B. Bulletin, The Incorporated Radio Society of Great Britain, New Ruskin House, Little Russell Street, London, W.C.1, England. (*R.S.G.B. Bull.*)
Radio and Electronics, 46, Mercer Street, Wellington, New Zealand. (*Radio & Electronics, Wellington N.Z.*)
Radio Component Manufacturers' Association Technical Bulletin, 22, Surrey Street, London, W.C.2, England. (*Radio Component Mfrs' Ass. tech. Bull.*)
Radio Craft, 29, Worthington Street, Springfield 3, Massachusetts, U.S.A. (*Radio Craft*)
Radio française (formerly **Radio en France**), 92, Rue Bonaparte, Paris VI^e^, France. (*Radio franç.*)
Radio News, Ziff Davis Publishing Co., 185, N. Wabash Avenue, Chicago, 1, Illinois, U.S.A. (*Radio News*)
[illegible] professionelle, 81, rue de la Pompe, Paris XVI^e^, France. (*Radio prof., Paris*)
La Radio professionelle Belge, 89, Avenue de la Liberté, Brussels, Belgium. (*Radio prof. belge*)
Radio Technical Digest (**Édition française**), 17 bis, rue Erlanger, Paris XVI^e^, France *and* Mr. Neuhauser, 180, Neasden Lane, London, N.W.10, England. (*Radio tech. Dig. Édn franç.*)
Radio Technik, Wien VI, Mariahilferstrasse 71, Austria. (*Radio Tech., Vienna*)
Radio Welt, Wien XV, Sechshauserstrasse 126, Austria. (*Radio Welt*)
Radiotekhnika, Moscow, U.S.S.R. (*Radiotekhnika, Moscow*)
Reports on Progress in Physics, The Physical Society, 1, Lowther Gardens, Prince Consort Road, London, S.W.7, England. (*Rep. Progr. Phys.*)
Research, Butterworths' Scientific Publications Ltd., 4–6, Bell Yard, Temple Bar, London, W.C.2. (*Research, Lond.*)
Review of Scientific Instruments, The American Institute of Physics, 57, East 55th Street, New York 22, N.Y., U.S.A. (*Rev. sci. Instrum.*)
Reviews of Modern Physics, Prince and Lemon Streets, Lancaster, Pennsylvania, U.S.A. (*Rev. mod. Phys.*)
Revista de Telecomunicación, Palacio de Communicaciones, Madrid, Spain. (*Rev. Telecomunicación, Madrid*)
Revista Telegrafica, Arbo Editores, Buenos Aires, Argentine. (*Rev. telegr., Buenos Aires*)
Revue générale de l' Électricité, 12, Place de Laborde, Paris VIII^e^, France. (*Rev. gén. Élect.*)
Revue scientifique, 4, Rue Pomereu, Paris XVI^e^, France. (*Rev. sci., Paris*)
Revue technique Compagnie française Thomson-Houston, 173, Boulevard Haussmann, Paris, France. (*Rev. tech. Comp. franç. Thomson-Houston*)

S

S.A.E. Journal, The Society of Automotive Engineers, Inc., 29, West 39th Street, New York 18, N.Y., U.S.A. (*S.A.E. J.*)
Schweizer Archiv für angewandte Wissenschaft und Technik, Privatdozent Dr. Hans Stäger (Ed.), Zürich, Orütlistrasse 50; Buchdruckerei Vogt-Schild A.G., Solothurn, Switzerland. (*Schweiz. Arch. angew. Wiss. Tech.*)
Science, Secretary for American Association for the Advancement of Science, Smithsonian Institution Building, Washington, D.C., U.S.A. (*Science*)
Science and Culture, The Indian Science News Association, 92, Upper Circular Road, Calcutta, India. (*Sci. Culture*)
Scientific Monthly, A.A.A.S., 1515, Massachusetts Avenue, N.W., Washington, 5, D.C., U.S.A. (*Sci. Mon., N.Y.*)
Short Wave Magazine, 49, Victoria Street, London, W.1, England. (*Short Wave Mag.*)

T

T.S.F. pour Tous, Étienne Chiron, 40, Rue de la Seine, Paris, France. (*T.S.F. pour Tous*)
Technical Bulletin of the National Bureau of Standards, U.S. Government Printing Office, Washington, D.C., U.S.A. (*Tech. Bull. nat. Bur. Stand.*)
Technique moderne, Éditeur Dunod, Paris VI^e^, France. (*Tech. mod., Paris*)
Technische Mitteilungen, Bulletin Technique (direction générale PTT), Berne, Switzerland. (Swiss Post Office publication.) (*Tech. Mitt. schweiz. Telegr.-Teleph Verw.*)
Tecnica elettronica, Via Strobel 6, Milano, Italy. (*Tecn. elettronica*)
Tele-Tech (formerly part of **Electronic Industries**), Caldwell-Clements Inc., Orange, Connecticut, U.S.A. (*Tele-Tech*)
Telegraph and Telephone Age, 25, Beaver Street, New York 4, N.Y., U.S.A. (*Telegr. Teleph. Age*)
Télévision française (and supplement **Électronique**), 143, Avenue Émile-Zola, Paris XV^e^, France. (*Télévis. franç.*)
Terrestrial Magnetism and Atmospheric Electricity, The William Byrd Press Inc., 8, North 6th Street, Richmond, Virginia, U.S.A. (*Terr. Magn. atmos. Elect.*)
Tijdschrift van het Nederlandsch Radiogenootschap, Oude Utrechtscheweg 8, Baarn, Holland. (*Tijdschr. ned. Radiogenoot.*)
Toute la Radio, 143, Avenue Émile-Zola, Paris XV^e^, France. (*Toute la Radio*)
Transactions of the American Institute of Electrical Engineers, 33, West 39th Street, New York 18, N.Y., U.S.A. (*Trans. Amer. Inst. elect. Engrs*)
Transactions of the Danish Academy of Technical Science, 1, Kommission Hos G.E.C. Gad, Vimmelskaftet 32, Copenhagen K, Denmark. (*Trans. Dan. Acad. tech. Sci.*)
Transactions of the Faraday Society, 6, Grays Inn Square, London, W.C.1, England. (*Trans. Faraday Soc.*)
Transactions of the South African Institute of Electrical Engineers, corner Marshall and Holland Streets, Johannesburg, S. Africa. (*Trans. S. Afr. Inst. elect. Engrs*)

U

United States Government Publications, U.S. Government Printing Office, Washington 25, D.C., U.S.A. (*U.S. Govt Publ.*)

W

Weather, 49, Cromwell Road, London, S.W.7, England. (*Weather, Lond.*)
Wireless Engineer, Dorset House, Stamford Street, London, S.E.1, England. (*Wireless Engr*)
Wireless World, as **Wireless Engineer.** (*Wireless World*)

Z

Zeitschrift für angewandte Physik, Springer-Verlag, Berlin-Charlottenburg 2, Jebensstrasse 1, Germany. (*Z. angew. Phys.*)
Zeitschrift für Naturforschung, Dieterich'sche Verlagsbuchhandlung, Inhaber: W. Klemm, Wiesbaden, Spiegelgasse 9, Germany. (*Z. Naturf.*)
Zhurnal eksperimentalnoi y teoreticheskoi Fiziki, Academy of Sciences, U.S.S.R. (*Zh. eksp. teor. Fiz.*)
Zhurnal tekhnicheskoi Fiziki, Academy of Sciences, U.S.S.R. (*Zh. tekh. Fiz.*)

Section IV—1949

Index to

Abstracts and References

This section contains an index, listed separately by author and by subject, for all Abstracts and References published in PROCEEDINGS OF THE IRE from February, 1949, through January, 1950.

AUTHOR INDEX

AUTHOR INDEX—A name followed by "and" is that of the first author of a jointly written paper, while the word "with" indicates that the name indexed is that of the second author.

A

Abele, M., energy of passive linear 2-pole network in transient regime, **3079**; propagation in dielectric waveguides of circular section, **1287**; solution of Maxwell's equations for field in cavity resonator, [illegible]
—— and C. M. Garelli, rectangular waveguides with several dielectrics, [illegible]
Abelès, F., e.m. wave propagation in stratified media, **818, 2604, 2893**
Aberdam, H., dielectric aerials, **3345**; wide-band matching by means of several intermediate elements, **665**
Abraham, L. G., and others, pulse echo measurements on cables, **790**
Acker, J. T., oxide-cathode core-material tests, **2674**
Adam, M., Dictionnaire de Radiotechnique, **(B)599**; recent trends in radio technique, **2199**
Adams, M. B., and D. K. Reynolds, converters for u.h.f. television reception, [illegible]
Adams, O., stresses in 2-wire glass/metal seals, **113**
Adams, P. R., performance criteria for localizer and glide-slope ground installation, **(A)1672**
—— with others, review of radio navigation aids, **1399**
Adams, R. J., and K. S. Kelleher, diffraction pattern for elliptical aperture, **(A)1578**
Adams, R. T., with others, v.h.f. airborne navigational equipment, **(A)1672**
Adcock, M. D., with A. S. Dunbar, gain of horn aerials, **1866**
—— with A. E. Marston, theory of end-fire helical aerials, **(A)1578**
Adorian, P., television distribution over short lines, **2339**
Agnew, W. B. R., moisture-sealing compound, **2813**
Aigrain, P. R., and E. M. Williams, design of amplifiers for optimum transient response, **3104**; network synthesis for desired transient response, **3360**; theory of amplitude-stabilized oscillators, **44**
Aiken, H. H., Mark III computer, **(A)1703**
Aikens, A. J., and L. Y. Lacy, test of 450-Mc/s urban-area transmission, **(A)1757**
Aisberg, E., transistron, French analogue of transistor, **2978**
Akeley, E. S., with P. Feuer, scattering by resonant ring in circular waveguide, **640**
Albanese, L., with P. Schiaffino, coaxial cables, **3084**
Albers-Schoenberg, E., and W. Soyck, dielectric properties of MgTiO, ceramics, **1414**
Albersheim, W. J., TE_{01} waves in curved waveguides, **2430**
Albert, G. E., and J. L. Synge, general problem of aerial radiation, **1859**
Alderton, G., with S. S. Carlisle, temperature coefficient of sensitivity of PbS photocells, **2369**
Aldrich, D. F., with E. M. Williams, speed of electronic switching circuits, **(A)1612**
Alekhin, E. A., earthing devices for communication equipment, **1197**
Alexander, F. W., broadcasting of orchestral music, **3319**
Alexander, J. W., calculations for circuits with f.m. voltages, **1883**
Alfvén, H., theory and applications of trochotrons, **2083**
Alixant, M., h.v. supply without transformer, **1199**; modern loudspeaker technique, **1855**; new radio components in world market, **2770**
Alkemade, C. T. J., with others, a.c. galvanometer, **3199**
Allan, H. R., and C. D. Curling, reflectometer, **1729**; resonant-cavity wavemeters for pulsed transmitters, **1130**
Allan, R., electrical engineering in tropics, **739**
Allen, C. W., critical frequencies, sunspots, and solar ultraviolet radiation, **1051**
Allen, E. W., Jr, propagation aspects of v.h.f. television, **(A)1757**; reflection of v.h.f. waves from meteoric ionization, **(D)489**; u.h.f. propagation characteristics, **3240**
Alma, G., and F. Prakke, rimlock miniature valves, **2080**
Alpers, E., with T. Gast, dielectric measurements by balance methods, [illegible]
Al'pert, Ya. L., formation and mechanism of ionosphere layers, **1380**
van Alphen, P. M., and H. Rinia, projection-television receiver optical system, **1215**
—— with H. Rinia, correction plates for Schmidt optical systems, **63**
—— with others, home projection television, **3275**
Alred, R. V., and A. Reiss, logarithmic anti-clutter radar receiver, **1172**
Alsberg, D. A., and D. Leed, phase and insertion-loss measurement for video frequencies, **2836**
Amble, O., connection for Bush integrators, **1108**
Ament, W. S., with C. L. Pekeris, microwave propagation in refracting atmosphere, **479**
—— with R. J. Urick, propagation of sound in composite media, **2686**
Ames, M. E., wide-range deviable oscillator, **2177, 2478**
Amos, S. W., output voltage of valves with resistive loads, **2084**
Anan'ev, P. V., channels of equal acoustic quality in wire broadcasting, **2424**
Andersen, W. M. A., with F. A. Metz, Jr, improved ultrasonic delay lines, **2747**
Anderson, E., with others, determination of aircraft ground speed using pulse-Doppler radar, **(A)1672**
Anderson, N., and S. Pakswer, comparison of PbS photocells with photoemissive cells, **1537**
Anderson, N. S., with others, attenuation of sound in fog and smoke, [illegible]
Anderson, R. E., 500–50000-V d.c. power supply, **2643**
Andrews, A. H., radar in U.S. ships, **(A)2803**
Andrews, D. H., with J. V. Lebacqz, r.f. properties of CbN, **2531**
Andrews, H. L., detection and measurement of nuclear radiation, **(A)1639**
Andrews, P., spectrometer for $\lambda = 10$ cm, with mechanical sweep, **2855**
Angel, Y., new colour-television system, **(A)871**; 1948 Paris television congress, **866**
Anon.,
  A.A. McK., direct-reading a.f. meter, **2272**
  "Cathode Ray", f.m., **216**; Miller effect, **3076**; negative feedback in amplifiers, **2197, (C)2767**; negative frequency, **24**; parasitic oscillations, **2172**; *Q*, **2755**; RC smoothing circuits, **3371**; Thévenin's theorem, **1615, 2741**
  D.A.O., magnetism, British Association symposium, **1025**
  D.G.F., 33⅓-r.p.m. 300-grooves/inch sound-recording system, **277**
  "Diallist", new magnetic alloy containing Nb, **1101**
  F.C. McL., frequency allocation for B.B.C. television service, **2047**
  v.Fe., 3-beam oscillograph for frequencies to 10000Mc/s, **2000**
  F.E.N., C.C.I.T. meeting, Brussels, May 1948, **271**
  G.G., television interference patterns, **2354**
  G.W.O.H., Alexander S. Popov, **(D)3315**
  H.G.M.S., *Q*-meters, **(D)2267**
  J.M., Electronics Park, Syracuse, N.Y., **592**
  M.A., climatization of radio equipment, **1966**
  P.H., *Q*-meters, **(D)2267**
  "Spenny", television interference suppression, **3285**
  Y.A., 819-line television standard for France, **(A)880**
Ansbacher, F., and W. Ehrenberg, electron-bombardment conductivity, **3404**
Apker, L., E. Taft and J. Dickey, photoelectric emission and contact potentials of semiconductors, **1098**
Appleton, E. V., forecasting of ionospheric conditions, **(D)483, (D)2894**
—— and W. J. G. Beynon, lunar oscillations of ionosphere, D layer, **3133**, F_2 layer, **719**
—— W. J. G. Beynon and W. R. Piggott, anomalous effects in ionospheric absorption, **192**
Arguimbau, L. B., Vacuum Tube Circuits, **(B)355**
—— and J. Granlund, f.m. transatlantic communication, **518, 1506**
Armstrong, E. H., f.m. ratio detector, **1775**
Arnaud, J. P., transistor, **915**
Arnett, H. D., with others, solution of 2-beam electron-wave-valve equation, **(A)1824**
Arsetiès, H., dissipation in medium with selective absorption, **1756**; total reflection in magnetic media, **1755**
Aschen, R., design of stagger-tuned television i.f. amplifier, **3394**; 4-unit television receiver without transformers, **2658**
Aschère, H., fault finding in underground cables, **286**
Aschoff, V., 3-ammeter method for capacitance of electrolytic capacitors, **3465**
Ashby, W. R., design for an electronic brain, **1144, (D)1739, 2011**
Ashford, O. M., and H. J. Ferrer, Meteorological Office radar reflector Mark IIB, **1735**
Ashour, A. A., and A. T. Price, induction of electric currents in non-uniform ionosphere, **1049**
Ashton, J. H., and A. N. Beresford, omnidirectional radial-track guide, **100**
Ashwell, G. E., with B. G. Pressey, radiation from car ignition systems, **1779**
Astbury, N. F., iron-testing by wattmeter and bridge methods, **771**
Astrahan, M. M., with W. A. Hughes, duo-mode waveguide exciter, **3336**
—— with others, open-ended-waveguide radiators, **2432**
Aström, E., theory and applications of trochotrons, **2083**
Atkinson, F. V., Sommerfeld's radiation condition, **2803**
Atkinson, P. D., with H. M. Gale, magnetic amplifiers, **(A)971, 2729**
Attree, V. H., d.c. low-impedance stabilized power supply, **3556**
Attura, G. M., servomechanism performance, **2640**
Attwood, C., Practical Five-Figure Mathematical Tables, **(B)1981**
Aubry, R., electronic telecontrol of artillery, **3515**
Auerbach, I. L., and others, Hg delay-line memory, **3082**
Axon, P. E., and H. Davies, measurement of wow, **1570**
Ayer, R. B., Th/W filaments in high-power transmitting valves, **(A)1824**
Ayer, R. W., airborne anti-collision radar, **728**
Aylward, W. R., and E. G. Fubini, electronic multi-couplers, **(A)1612**
Ayzanov, M. M., parameters of amplifier circuits, **2762**

B

Babb, M. A., convectron dynamic vertical-sensing element, **455**
Babcock, W. C., λ/4 inverted-L aerials for trains, **2717**
—— and H. W. Nylund, aerials for multichannel mobile telephony, **(A)1578**
Bachman, C. H., Techniques in Experimental Electronics, **(B)2297**
Bader, W., frequency comparison with cycloids, **3481**; trapezoidal waveform with minimum distortion, **(D)1302**
Baer, W., new dynamic microphone, **3023**
Baggott, A. J., and C. H. Fawcett, development of magnetic and acoustic mines, **(D)1450**
Bagley, J. H., with F. Caplin, mobile spaced-loop direction finder, **1076**
Bailey, D. K., geomagnetic nature of F_2-layer longitude effect, **389**; new method for exploring upper ionosphere, **387**
Bailey, R., Canadian aerial magnetic surveys, **1734**
Bailey, R. W., metals for high duty, **(A)3442**
Bailey, V. A., plane waves in ionized gas, **2785**; space-charge wave amplification effects, **3406**
Bainbridge-Bell, L. H., circuit symbols, notes on B.S.530, **664, 2164**
Baker, G. M. K., with others, Frequency Modulation, Vol. 1, **(B)529**; Radio at Ultra-High Frequencies, Vol. 2, **(B)923**
Baker, G. W., rugged valves, **(A)1824**
Bakker, C. J., fluctuations and electron inertia, **255**; valve noise and transit time, **(D)3310**
Balakrishnan, C., J. D. Craggs and A. A. Jaffe, discharge spread in G-M counters, **163**
Baldinger, E., and R. Casale, scaling-down circuits, **977**
—— P. Huber and K. P. Meyer, high-speed coincidence circuit for multipliers, **167**
Balthis, D. L., coaxial 50-kW f.m. broadcast amplifier, **2365**
Bamford, C. H., photochemical processes in O/N atmosphere, **1376**
Banderet, N., with R. Mercier, ultrasonic absorption by solids, **(A)931**
Bandow, F., quenching of luminescence of ZnS-Cu and CaS-Bi phosphors, **3155**
Banerjee, B. M., a.c. permeability of d.c.-magnetized transformer sheet steel, **755**
—— and S. K. Sen, gas-filled double photocell in current stabilizer, **896**
Banerjee, S. S., and G. C. Mukerjee, fading of s.w. signals, and space-diversity reception, **823**
—— and R. N. Singh, periodic fading of s.w. signals, **1166**
Bangert, J. T., with S. Rosen, theory of waveguide directional couplers, **2169**
Baracket, A. J., television synchronizing signal generator, **448**
Baranov, V., with G. Fuchs, attenuation and phase distortion and their effect on television signals, **(A)654, 1871**
Baranul'ko, V. A., temperature of ionosphere, **1054**
Barber, N. F., magnetic field due to earth currents in estuary, **384**; optimum performance of wave analyser, **2265**
—— and F. Ursell, response of resonant system to gliding tone, **670**
Barcala, J. M., crystal discriminators, **1000**
Bardeen, J., and W. H. Brattain, transistor, semiconductor triode, **264, 2879**
—— with W. H. Brattain, transistor, **(A)2680**
Barfield, R. H., statistical plotting methods for radio d.f., **1067**
Bargellini, P. L., Miller f.m. circuit and use for railroad radio, **343**
Bark, A., variable-frequency impedance-matching transformer, **962**
Barker, C. B., with H. J. Riblet, reflection of e.m. waves from curved surface, **816**
Barker, J. R., coil systems for uniform magnetic fields, **3468**
Barker, R. H., rhombic-aerial design chart, **649, 959**
Barlow, E. J., Doppler radar, **2229**
Barnes, R. B., and C. J. Burton, visual methods of studying ultrasonic phenomena, **2119**
—— with C. J. Burton, visual demonstration of paths of ultrasonic waves, **2869**
Barnet, F. R., A. Lightbody and H. A. Perry, conductive plastic materials, **(A)1681**
Barone, A., ultrasonic generator, **967**
Barré, M., with R. Bureau, atmospherics recording on s.s. *Commandant Charcot*, **3429**
Barrett, J. O. G., with others, naval h.f. c.r. direction finder, **1064**
Barstow, J. M., rural carrier-current telephony, **829**
Bartelink, E. H. B., and others, rural carrier-current telephony, **830**
Bartenev, G. M., forecasting ionospheric critical frequencies and disturbances, **2227**
Barthélemy, R., French work on television, **1526**; television line standards, **2344**
Barton, L. E., with others, circuits for the transistor, **1905**
Barzilai, G., current and charge distribution along cylindrical aerials, **3047**; mutual impedance of parallel aerials, **648, (C)1867**
—— and G. Latmiral, diversity reception for u.s.w. radio links, **1468**
Bast, G. H., D. Goedhart and J. F. Schouten, 48-channel carrier telephony system, **3251**
Bastin, D. H., microphone calibration, **763**
Bates, D. R., with F. Hoyle, origin of E layer, **388**
—— with H. S. W. Massey, atomic oxygen in upper atmosphere, **1379**
Bates, J. A. V., characteristics of human operator of servomechanisms, **2329**
Bath, C.C., and H. Goldberg, thermistor bridge for r.f. power measurement, **441**
—— with H. Goldberg, multiplex system using p.t.m. and p.f.m., **1790**
Battersby, L. R., with others, microwave filter theory and design, **3374**
Battison, J. H., radiation patterns of directive broadcasting aerials, **2146**
Bauer, B., a.f. signal generator, **793**
Bauer, L., P. Tamarkin and R. B. Lindsay, scattering of ultrasonic waves in water by cylindrical obstacles, **609**
Bay, Z., and G. Papp, coincidence circuit with high resolving power, **974**
Bayliss, R. W., with H. V. Griffiths, electronic switch for diversity reception, [illegible]
Beale, F. S., s.s.b. power-line carrier equipment, **2630**
Beam, R. E., propagation in beaded lines, **285**
—— M. M. Astrahan and H. F. Mathis, open-ended-waveguide radiators, **2432**
Beane, N. J., with D. Fairweather, frequency/temperature relationships of l.f. quartz plates, **1965**
Beanland, C. P., Marconi s.s.b. receiver Type CRD.150/20B-SSR2, **1771**
Beard, E. G., screens for stereoscopic television and the cinema, **3273**
Beard, M., multiple-track range, **2804**
Beasley, E. W., with W. T. Thornhill, influence of corona on design of h.v. apparatus, **70**
Beaudoin, L., with others, use of radioactive elements for study of oxide cathodes, **3592**
Beaumariage, D. C., with others, analysis of magnetic amplifiers, with feedback, **(A)2448, 3064**, without feedback, **(A)2447**
Bechmann, R., EDT crystals with zero temperature-coefficient of frequency, **3165**; elastic oscillations of rectangular quartz crystals, **2778**
—— and V. Petržílka, length oscillations of crystal rods, **2777**
Beck, A. H. W., Modern Radio Technique, **(B)3602**; Velocity-Modulated Thermionic Tubes, **(B)1249**
Beck, F. J., and J. M. Kelly, magnetization in perpendicular direct and alternating fields, **1410**
Beck, H. M., with J. D. Young, design equations for reactance-valve circuits, **3383**
Becker, J. A., and J. N. Shive, Type A transistor, **2404**
Becker, R., cm-λ aerial absorption surfaces, **961**
Beckman, L., influence of transverse magnetic field on cylindrical plasma, [illegible]
Beckmann, B., attenuation phenomena in ionosphere, **1165**
Becquemont, J., modern h.f. transmitting valves, **2082**; for television, **(A)905**
Bedford, L. H., strobe principle in radio and radar, **31**
Beghian, L. E., forecasting of s.w. propagation conditions, **820**
Begovich, N. A., h.f. total-emission loading in diodes, **2959**
Begun, S. J., magnetic field of ring recording head, **836**; Magnetic Recording, **(B)3332**
Behling, H., receiver sensitivity with complex aerial resistance, **2900**
Behrend, W. L., with others, multiple operation of u.h.f. transmitter valves, **(A)1810, 2943**
Beitman, M. N., Most-Often-Needed 1949 Radio Diagrams and Servicing Information, **(B)2317**
von Békésy, G., cochlea partition, resonance at various points on, **2122**, vibration of, **2121**; new audiometer, **3325**; structure of middle ear and hearing by bone conduction, **2120**
Bekkering, D. H., and C. W. Kosten, measurement of sound absorption at low frequencies, **936**
Beleskas, S. M., ph.m. circuit, **341**
Belevitch, V., nonlinear effects in ring modulators, **2184**; transmission losses in 2*n*-terminal networks, **1321**
Belin, E., facsimile, **1202**
Bell, D. A., developments in f.m. techniques, **2633**; gain of aerial systems, **3057**; impedance measurement and matching for television aerials, **18**; intensity/distance law of radiation, **(D)482**; maximum directivity of an aerial, **(D)22**; retarding-field current in cylindrical diode, **2960**; simplified magnetic amplifier, **315**
Bell, J., trends in thyratron construction, **1239**
—— and J. W. Davies, development of transmitting valves, **3301**
—— and others, u.s.w. triode oscillators, **(D)338**
Bell, R. L., negative-grid partition noise in triodes, **571**
Belus, R., manufacture of cables and loading coils, **1276**
Benbow, G. L., modifying T.R.1143 for amateur use, **1786**
Benham, W. E., analysis of low-frequency potentials of the human body, **170**; Fourier analysis and electrocardiogram, **2255**; transit-angle functions and Fourier transforms, **2961**
Benner, A. H., predicting m.u.f. from long-distance scatter, **1762**
Bennett, F. D., with J. S. Brown, matrix technique for triode circuits, **(D)2168**
Bennett, H. S., transmission-line characteristics of sectoral horn, **3043**
Bennett, S., construction of KOMO studios, **1187**
—— with F. J. Brott, planning of KOMO studios, **1186**
Bennett, W. P., and others, 100-W 1000-Mc/s grounded-grid triode, **569**
Bennett, W. R., linear varying-parameter and nonlinear circuit analysis, **(A)1612**; spectra of quantized signals, **895**
—— and L. C. Peterson, e.s. field in triodes, **2961**
Bennington, T. W., ionosphere review, 1948, **1385**
Benson, F. A., voltage stabilizers, **3555**
Benson, J. E., and W. A. Colebrook, telecontrolled tunable receiver installation, **2884**
—— and E. M. Dash, quartz-crystal chronometer, **1113, 3183**
Benson, R. W., with others, interactions between microphones, couplers and earphones, **2129**
Bent, A. E., radar detection of precipitation, **393**
Benz, F., *Q* calculation for single-layer coils, **1306**
Beranek, L. L., developments in design of European studios, **(A)1563**; International Conference on Acoustics, London, 1948, **2115**; sound transmission through multiple structures, **2997**
—— with R. H. Bolt, recent developments in applied acoustics, **1253**
Berberich, L. J., with E. W. Lindsay, electrical properties of ceramics, **(A)1682**
Beresford, A. N., with J. H. Ashton, omnidirectional radial-track guide, **100**
Bereskin, A. B., cathode-compensated video amplifiers, **2771**
Berger, K., earth connections subjected to high-current surges, **1697**
Beringer, R., with H. L. Schultz, high-resolution coincidence-counting system, **166**
Berkley, C., new types of c.r.o., **(A)443**; 3-dimensional representation on c.r.o., **1242**
—— and R. Feldt, c.r. tube applications in photography and optics, **(A)2596, 3226**
—— and H. Mansberg, photographic techniques in c.r. oscillography, [illegible]
Berkner, L. V., and H. W. Wells, Ionospheric Research at Watheroo Observatory, Western Australia, June 1938–June 1946, **(B)397**
Bernier, J., excitation and coupling of cavity resonators, **1621**
Bernstein, H. E., with L. J. Tatom, standardization of components by A.S.E.S.A., **2445**
Bernstein, W., proportional counter for β-ray detection, **(A)1733**
Bernstorff, H., German methods of iron-powder manufacture, **3172**
Berry, C. E., and J. C. Pemberton, 12-equation computer for linear equations, **1978**
Berry, F. M., filter design for s.s.b. transmitter, **3290**; f.m. receivers with ultrasonic control, **3529**
Berry, M., modern mathematical machines, **129, 130**
Bertaut, F., coercive field and crystal dimensions, **3436**
Bertein, F., field asymmetry in e.s. lenses, **3510**; nonlinear theories of e.m. field, **2207**
—— and E. Regenstreif, asymmetry of e.s. lenses, **2879**
Bertarottière, R., with others, amplification in double-beam valve, **2977**
Bertolotti, S., 100-kW broadcasting transmitter, Naples, **3292**
Best, N. M., and P. J. Duffell, indoor television aerial, **2719**
Bethe, H. A., with E. D. Courant, e.s. deflection of betatron or synchrotron beam, **1150**
Bevan, P. A. T., grounded grid power amplifiers, **2763**
—— with T. C. Macnamara, televising the 1949 Oxford and Cambridge boat race, **2343**
Beydon, J., and others, use of radioactive elements for study of oxide cathodes, **3592**
Beyer, R. T., with J. A. Krumhansl, theory of magnetic amplifiers, **2730**
—— with M. C. Smith, ultrasonic absorption in water at 0°–80° C, **686**
Beynon, W. J. G., horizontal motion of F_2 layer, **1663**; e.m. wave propagation in ionosphere, reflection at oblique incidence, **484, (A)485**
—— with E. V. Appleton, lunar oscillations of ionosphere, D layer, **3131**, F_2 layer, **719**
—— with others, anomalous effects in ionospheric absorption, **192**
Bezladnov, N. L., optimum operating conditions for amplifying valves for broadcasting, **2662**
Bhatt, N. B., and D. L. Subrahmanyam, electronic reverberation recorder, **6**
Bhattacharya, D. L., with others, horizontal electron microscope, **1747**
Bien, R. P., and Yu Han Yang, fluctuation of emission from oxide cathodes,

[illegible]
Bierman, A., 0-MeV betatron without iron yoke, 2015
Bigg, E. K., with others, glow discharge between coaxial cylinders, 2781
Biggs, A. J., and J. E. Houldin, *Q*-meter methods of impedance measurement, 3192
Billig, E., and K. W. Plessner, efficiency of Se photocells, 2371
Bingley, F. J., WOR television and f.m. transmitter, 3571
Birchall, M., c.w. landing aids, 98
Bird, D. W., and H. Pelzer, crystallite size and electric strength of polythene, 1696
Birkinshaw, D. C., television studio technique, 3284
Birks, J. B., physical applications of microwaves, 1650
Birnbaum, M., ionization and deionization times of thyratrons, 2553
Bishop, H., war-time broadcasting, (D)526, (D)2915
Bishop, P. O., with E. J. Harris, design and limitations of d.c. amplifiers, 3384; l.f. noise from amplifying valves, 574
Blaché, F., pulse-transformer design, 2154
Blachman, N. M., demodulation of f.m. carrier and random noise by limiter and discriminator, 1772, (A)3246
Black, A. O., Jr, effect of core materials on magnetic-amplifier design, 2449
Black, H. S., and J. O. Edson, p.c.m., 842
Black, W. C., aerials and receivers for Rural Radio Network, 495
Blackburn, J. F., Components Handbook, (B)3115
Blackett, P. M. S., magnetic field of massive rotating bodies, 1925
Blaise, R. E., with J. A. Sargrove, f.m. and ph.m. demodulator, 1170
Blake, K. W., external cross-modulation in 100-Mc/s band, 504
Blanc, C., linear differential equations with slowly variable coefficients, 1423
Blanc, D., and M. Schérer, G-M counters with external cathode, 3212
Blanc-Lapierre, A., harmonic analysis of aleatory functions, 2254
Blass, J., with H. J. Carlin, direct-reading d.c. bridge for microwave power measurement, 2565
Blattner, H., and W. Merz, anomalies of specific heat of BaTiO$_3$, (A)1090
—— W. Känzig and W. Merz, production and investigation of BaTiO$_3$ single crystals, 1689
—— and others, domain structure of BaTiO$_3$ crystals, (A)1089
Bleaney, B., microwave absorption of gases, (A)367
Bliss, W. H., electronic digital counters, 2257
Bloembergen, N., with J. M. W. Milatz, photoelectric a.c. amplifier with a.c. galvanometer, 1908
Bloom, A., with V. W. Cohen, reduction of microphony in triodes, (D)2963
Bloom, L. R., and W. W. Cannon, wide-tuning-range low-power c.w. magnetron, (A)1824
Boehnker, C. H., with J. N. Hines, measurement of phase of radiation from aerials, 2571
Boelens, W. W., linear grid modulation using feedback resistor in cathode lead, 1246
—— and F. L. H. M. Stumpers, measurement of hum and noise, 2837
—— with F. L. H. M. Stumpers, measurement of distortion in frequency modulator, 1991
Boella, M., limits of frequency and time comparisons at great distances, 1427
de Boer, F., with J. H. van Santen, refractive index of BaTiO$_3$ and Ti compounds, 2534
de Boer, J., and G. Schenkel, electromechanical feedback, 603
Boerner, T. J., 150-kW a.m. transmitter, 3288
Boillet, P., with F. Croze, Huyghens' principle, 1463
Boissière, J., with others, forced-air cooling of transmitting valves, 2377
Bolle, A., ionosphere-sounding equipment, 3062
Bolljahn, J. T., radiation from rectangular waveguides, (A)1578, 2433
Bolt, R. H., and L. L. Beranek, recent developments in applied acoustics, 1253
—— S. Labate and U. Ingård, acoustic reactance of small circular orifices, 2701
Bömmel, H., NH$_4$H$_2$PO$_4$ crystals as ultrasonic generators, 929
Bond, D. S., ultrafax facsimile system, (A)1785
—— and V. J. Duke, ultrafax facsimile system, 2055, 2340
Bondi, H., review of cosmology, 1029
Bonetti, A., velocity of ultrasonic waves in e.s. field and effect of temperature, 3002
Booker, H. G., anomalous radar ranges, 492; problems in radio meteorology, 1159; Sommerfeld theory and edge diffraction, (A)480
Boon, J. L., W. Feldman and J. Stoiber, television recording camera, 236
Boosman, H. B. R., and E. H. Hugenholtz, frequency control in transmitters, 2070
Boot, H. A. H., and J. T. Randall, cavity magnetron, (D)3309
Booth, A. D., magnetic digital storage system, 3179; recent computer projects, 1425
—— and K. H. V. Britten, high-speed digital computers, 3177
Booth, C. F., nomenclature of frequencies, 2413; receiving system at Cooling R/T station, 3247
—— and J. P. Johns, mass production of quartz crystals, 111
Booth, R. H., triode interelectrode capacitances, (D)2962
Boothroyd, A. R., E. C. Cherry and R. Makar, electrolyte tank for network-response measurements, 2743
Boothroyd, W. P., heterodyne modulation and wide-band f.m. television relays, 838
—— and E. M. Creamer, Jr, band-limited transmission systems, (A)1785; time-division multiplex system, 3258
Bordoni, P. G., synchronous frequency division, 1337
—— and W. Gross, sound radiation from finite cylinder, 2685
Borg, H., frequency stabilization of v.m. valves, 2104
Borg, L. F., with S.-E. Hedstroem, transductor fundamentals, 313
Borgars, S. J., German capacitors, 663
Borger, R., with T. G. Cowling, electrical conductivity of ionosphere D region, (D)85
Borgnis, F., cm-λ dielectric measurements at 20°-400°C, 2248; general properties of paraxial electron-optic image, 1351, 2780
Born, M., and Kai Chia Cheng, theory of superconductivity, 68
Bosinelli, F., gain of microwave radiating system, 3056
Bosley, W., and others, 20-MeV betatron, 179, (D)2014, spectrum of X-rays from, 180
Bosse, G., with H. Wilde, magnetic hysteresis of silicon-iron, 1467
Boswell, I. I., with others, dielectric properties of titanates, 1970
Botden, T. P. J., with others, influence of temperature quenching on fluorescence decay, 3157
Bottema, M., with others, influence of temperature quenching on fluorescence decay, 3157
Boucke, H., and H. Lennartz, beat-frequency oscillator for carrier frequencies, 3208
Boughtwood, J. R., 150-kc/s carrier system for radio relay applications, 2637
Boulx, M., reflections in transmission lines at u.h.f., 1280
Bourdon, R., fault finding in underground cables, (D)287
Bouthillon, L., rationalization of units, 2775; tensors and electricity, 2541
Bouwkamp, C. J., Hallén's theory for straight wire aerial, 953; singularities in diffraction at sharp edges, 2210; theory of coupled aerials, 960
—— and N. G. de Bruijn, e.s. field of point charge inside cylinder, (C)687
Bowdler, G. W., wide-range variable capacitor, 2564
Bower, J. L., J. T. Fleck and P. F. Ordung, synthesis of RC lattice structure, (A)1612
Bowes, [illegible], with others, electronic mapping of activity of heart or brain, 1741
Bowie, R. M., negative-ion blemish in c.r. tubes, 1243
Bowlus, O. E., and P. T. Nims, parallel operation of aircraft alternators with electronic frequency changers, 656
Boyajean, J., electronic half-tone engraving machine, 2592
Boyce, C. F., with others, 12-channel carrier telephony systems in South Africa, 3539
Boyd, W. E., analysis of low-frequency potentials of the human body, 170
Boyer, J. M., discone aerial for 40–500 Mc/s, [illegible]
Boykin, J. R., 10-kW f.m. broadcast amplifier, 1904
Braak, D. J., f.m. *vs* a.m., (D)3257
Bracewell, R. N., propagation of very long radio waves, (A)438
—— and T. W. Straker, solar flares and phase of very long reflected radio waves, 3416
—— and K. Weekes, ionospheric absorption, (D)3521
Bradburd, E., magnetostrictive delay line, (A)1578
Bradley, W. E., superregenerative detection theory, 496
Bradshaw, E., and others, h.v. measurement by oscillating electrode systems, 780
Brailsford, F., magnetic materials, 1417, for electrical power plants, (A)3442
Bramley, E. N., with W. Ross, tilts in the ionosphere, 3424
Brattain, W. H., physics of transistor, (A)1681
—— and J. Bardeen, transistor, (A)2680
—— with J. Bardeen, transistor, semiconductor triode, 264, 2979
Bray, F. H., D. S. Ridler and W. A. G. Walsh, use of gas-filled tubes for number storage and sending, 2322
Bray, R., dependence of resistivity of Ge on electric field, 3438
van der Breggen, J. C., with H. J. Lindenhovius, h.f. permeability and loss measurement, 144
Bremmer, H., ionospheric double refraction, 3519; propagation of radio waves round earth, 3280; spherically symmetrical inhomogeneous waveguides, 1158; Terrestrial Radio Waves, (B)3242; theory of e.m. wave propagation, 1471
Brett, J. G., with others, 15-inch glass toroid for betatron, 471
du Breuil, F., with others, 100-kc/s magnetostrictive transducer, 627
Bricard, J., ionic equilibrium of the lower atmosphere, 2225
Bricka, M., and H. Bruck, electron gun for h.v. tubes, 1460
Bridges, J. F., with M. W. Scheldorf, broad-band fan aerials, 2437
Briggs, B. H., Miller integrator, 347; Miller timebase, 1625
Briggs, J. H., and W. H. Mitchell, direct-reading fluxmeter, 1721
Brillouin, L., waveguides for slow waves, 1584
—— and H. P. Iskenderian, thermomagnetic generator, 1309
Brimley, K. J., electronic stopclock, 2259
Brinkley, J. R., multi-carrier v.h.f. police radio system, 228
Brinkman, H., with J. A. H. Kersten, direct-reading hot-wire vacuum gauge, 1947
Britten, K. H. V., with A. D. Booth, high-speed digital computers, 3177
Britton, K. G., reduction of heater hum, 54
Broc, J., measurement of cm-wave power with bolometer, 2860
Brockelsby, C. F., a.f. transformer design, 1607; negative-feedback amplifiers, 1910, (D)2768
Broer, L. J. F., with others, photoelectric voltages with intermittent light, 1916
Bronwell, A., chromoscope colour-television viewing tube, 539
Bronwell, A. B., with others, multiplex transmission through waveguides, 300
Bronzo, J. A., and H. G. Cohen, analogue-computer design, 1979
Brooks, H., breakdown voltage of paper-dielectric capacitors, 748
—— with B. Epstein, theory of extreme values and dielectric strength of paper capacitors, 1308
Brooks, H. B., radar observations of thunderstorms, 392
Brossart, J., and O. Doehler, travelling-wave valve with magnetic field, 1544
Brott, F. J., and S. Bennett, planning of KOMO studios, 1186
—— and C. E. Miller, KOMO 50-kW a.m. transmitter, 1222
Brown, A. H., consol navigation system, 108
Brown, D., C. F. Coleman and J. W. Lyttleton, photoelectric acoustic spectrograph, 1844
Brown, D. A. H., tuned 5-c/s amplifier for use with thermocouples, 2766
Brown, D. R., and N. Rochester, rectifier networks for multi-position switches, 1609
Brown, G. H., u.h.f. television field strengths near Washington, 1480
—— and others, multiple operation of u.h.f. transmitter valves, (A)1810, 2943
Brown, G. S., and D. P. Campbell, Principles of Servomechanisms, (B)2921
Brown, G. W., with E. A. Goldberg, electronic simultaneous-equation solver, 760
Brown, J., with S. S. D. Jones, metal delay lenses, 1868
Brown, J. S., and F. D. Bennett, matrix technique for triode circuits, (D)2168
—— and V. J. Moffatt, directive aerial for 152–162 Mc/s, 1869
Brown, L. W., with B. R. Davies, design of marine radar equipment, 2803
Brown, S. C., with E. C. Farmer, deterioration of methane-filled G-M counters, 801
—— with M. A. Herlin, u.h.f. breakdown of air between coaxial cylinders, [illegible]
Brown, S. L., and C. M. McKinney, mechanical harmonic synthesis in network analysis, 2460
—— and J. M. Sharp, mechanical harmonic synthesis in filter analysis, 3373
Brown, V. A., and B. P. Ramsay, Maxwell bridge at low frequencies, 2849
Brown, W. F., frequency measurement up to 12 kMc/s, 2838
Brown, W. N., Jr, electronics in guided-missile research, 476
Brownless, S. F., with T. Somerville, listeners' sound-level preferences, 1266
Bruck, G. G., cavity oscillator for generation of microwaves, 2477
Bruck, H., with M. Bricka, electron gun for h.v. tubes, 1460
Brück, L., linear gain of travelling-wave valve, 2954
de Bruijn, N. G., with C. J. Bouwkamp, e.s. field of point charge inside cylinder, (C)687
Bruk, I. S., S. S. Chugunov and N. V. Pautin, electronic frequency regulator, 2335
Brunel, A., motion of charged particle in field of current, 2211
Bryden, J. E., resistive phase shifters, 3204
Brylinski, E., mutual magnetic energy of current and magnet, 365; perfect magnet, 3406
Buchholz, H., e.m. waves in concentric cables, 13; impedance and attenuation calculation for h.f. transmission lines, 3333; integral and series representations for various wave types, 2774
Buchsbaum, W. H., design of a tuned r.f. television receiver, 3281
Buck, J. G., with E. A. Coomes, test-diode design, 2672
Buckley, S. E., Ni-Fe alloy dust cores, 122
Budeanu, C., units, (D)683
Budelman, F. T., equipment for remote pickups, 2913
Budenbom, H. T., waveguide-hybrid rings, 638
Buechler, L. W., magnetic amplifiers for warships, 1305
Buehler, E., and A. C. Walker, synthetic quartz crystals, (A)411
Bügel, R. D., with E. J. W. Verwey, ceramics with high dielectric constant, 2536
Bull, C. S., space-charge effects in beam tetrodes, (D)573
Bullard, E. C., magnetic field within the earth, 3130; secular change in earth's magnetic field, 381
Bullington, K., propagation variations at v.h.f. and u.h.f., (A)1757
Bunn, C. W., with H. A. Rigby, change of volume of polytetra fluoroethylene at 20°C, 3449
Bunting, E. N., with others, properties of Ba/Mg titanate dielectrics, 414; properties of ceramic dielectrics, 2537
Bürck, W., electroacoustic transducers, 1852
Bureau, R., applications of radio in meteorology, 1375
—— and M. Barré, atmospherics recording on s.s. *Commandant Charcot*, [illegible]
Burgess, R. E., ground absorption with elevated dipoles, 1864; transit-time effects in u.h.f. valves, (D)3312
Burkard, O., lunar tides in the upper ionosphere, 718; sporadic-F layer, 390
Burkhardtsmaier, W., frequency-independent s.w. resistance device, 28; impedance transformation by means of cable sections, 1885
Burkig, J. W., E. L. Hubbard and K. R. MacKenzie, pulsed oscillator for f.m. cyclotron, 2017
de Burlet, G., propagation of v.h.f. e.m. waves over the sea, 2368
Burnand, W. E., magnetization of permanent magnets, 1415
Burnap, R. S., with others, Frequency Modulation, Vol. 1, (B)529; Radio at Ultra-High Frequencies, Vol. 2, (B)923
Burr, R. P., measurement of modulation depth of television signals, (A)1810
Burrows, C. R., mechanisms of propagation, 1472; radio astronomy, 1367, 2509
Burt, A. D., with others, record changer and complementary record, 2711
Burton, A. C., with others, cardiochronograph, 1153
Burton, C. J., electron microscopy, 1748
—— and R. B. Barnes, visual demonstration of paths of ultrasonic waves, [illegible]
—— with R. B. Barnes, visual methods of studying ultrasonic phenomena, 2119
—— with W. C. Schneider, determination of elastic constants of solids by ultrasonic methods, 1732
Burtt, G. J., m.f. d.f. in British Navy, 1065
Busch, G., H. Flury and W. Merz, electrical conductivity and refractive index of BaTiO$_3$, (A)1091
Bush, R. R., with J. S. Donal, spiral-beam methods for a.m. of magnetrons, 2401
Busignies, H., beacon system for aircraft distance measurement, 1402, (A)1944; marine radio direction finders, 94
—— and M. Dishal, speed of indication, bandwidth and signal/noise ratio in radio navigation and d.f., 2232
—— P. R. Adams and R. I. Colin, review of radio navigation aids, [illegible]
Buss, G. R., and others, multiplex transmission through waveguides, 300
Butler, F., cathode-coupled crystal oscillators, 2173; rectifier voltage control by saturable reactors, 2224; variable-frequency phase-shift RC oscillators, 1896
Butler, F. E., thermistors, 2156
Butler, O. L., synchronization of controlled relaxation oscillators, [illegible]
Butterworth, A., magnetic mine detectors, 1155
Butz, A. N., Jr, with others, bearing deviation indication for sonar, 725
Buyer, M. S., with A. R. Vallarino, harmonic distortion in f.m. discriminator, 3534
Byard, S., impedance variations of electroacoustic transducer, 629
Byler, W. H., emission spectra of ZnS-CdS phosphors, 782
Byrne, J. F., impedance measurement at 100–400 Mc/s, 432

C

Cabessa, R., and G. Phélizon, u.h.f. standard receiver and generator, 792
Cady, W. G., theory of crystal transducer for plane waves, 2707
Cafferata, H., cylindrical radiator with concentric ring of subsidiary radiators, 1865
Cahen, L., inventor of radiotelegraphy, 2988
Cahn, J. H., electronic interaction in electrical discharges through gases, 1641
Callendar, G. S., with G. B. B. M. Sutherland, infra-red absorption spectra of atmospheric gases, 1348
Callendar, M. V., ignition interference, 2355; range of low-power transmitters, 1161; thermal noise in a.m. receivers, 1489
Calvert, J. F., H. R. Johnston and G. H. Singer, Jr, analogue computer for tenth-degree algebraic equations, 2548
Cameron, W. M., pulse/sinewave converter, 1606
Camp, L., lamination design for magnetostriction transducers, 628
—— and F. D. Wertz, low-*Q* magnetostrictive transducer, 3022
—— R. Vincent and F. du Breuil, 100-kc/s magnetostrictive transducer, 627
Campbell, A. J., Australian f.m. mobile communication equipment, 1191
Campbell, D. P., with G. S. Brown, Principles of Servomechanisms, (B)2921
Campbell, N. R., and L. Hartshorn, experimental basis of electromagnetism, 3123
Campbell, P. N., silicate phosphors for c.r. tubes, 1405
Campbell, R. H., Jr, and R. A. Chipman, noise from current-carrying resistors at 20–500 kc/s, 3067
Campet, H., broadcasting transmitters at Villebon, Rennes and Lille, 1820
Camras, M., analysis of linear magnetic recording with high-frequency excitation, 2133; magnetic recording tapes, 2422; stereophonic magnetic recorder, 2132
Cannon, W. W., with L. R. Bloom, wide-tuning-range low-power c.w. magnetron, (A)1824
Cantelo, H. R., properties of *m*-derived low-pass filters, 1890
Caplin, F., and J. H. Bagley, mobile spaced-loop direction finder, 1076
Carbenay, F., operation threshold for direction finders for atmospherics, 92
Carbrey, R. L., decoding in p.c.m., 844
Carey, J. J., with V. P. Hessler, Fundamentals of Electrical Engineering, (B)922
Carleton, J. T., Anacom computer and analysis of rototrol voltage regulators, 3547
Carlin, B., Ultrasonics, (B)3032
Carlin, H. J., broad-band dissipative matching structures for microwaves, 2466; broad-band microwave attenuator, (A)1713; broad-band microwave bolometers, 3205
—— and J. Blass, direct-reading d.c. bridge for microwave power measurement, 2565
—— and J. W. E. Griemsmann, coaxial attenuator for 4–10 kMc/s, 348
Carlin, J. R., industrial thickness gauges using radioisotopes, (A)1733, 3453
Carlisle, R. W., with others, vibrators for measuring pickup response, 775
Carlisle, S. S., electronic instruments in iron and steel making, 809
—— and G. Alderton, temperature coefficient of sensitivity of PbS photocells, 2369
Carlson, F. D., with others, effect of high altitude, on speech, 622, on threshold of hearing, 621
Carlson, H. V., portable f.m. equipment, 3260
Carpentier, E. E., electronic switch, 30
Carranza, C. M. A., abacs for tension, sag, etc. of overhead lines, 3033
Carrara, N., and P. Lombardini, radiation pressure of cm waves, 1759
—— P. Checcucci and M. Schaffner, experiments in e.m. optics, 1647
Carson, B. R., A. D. Burt and H. I. Reiskind, record changer and complementary record, 2711
Cartianu, G., negative-resistance devices, 1542
Cartwright, M. L., nonlinear vibrations, 2256
Carver, A. E., superrefraction of radar beams, 490
Casale, R., with E. Baldinger, scaling-down circuits, 977
Castelain, G., with others, biological effects of microwaves, 2283
Castellani, A. V., proposed television standard for Italy, (A)379
Cazalas, A., large-screen television projection, (A)886
Cazaly, W. H., valve megohmmeter, 3479
Chaffee, M. A., and R. B. Corby, radio control of Berlin air-lift, 3147
Chai, Yeh. See Yeh, Chai.
Challansonnet, J., with others, use of radioactive elements for study of oxide cathodes, 3592
Champion, K. S. W., with others, glow discharge between coaxial cylinders, 2781
Chance, B., combination of dead-reckoning and radar data, 1395
—— and others, Electronic Time Measurements, (B)2491; Waveforms, (B)[illegible]
Chang, Sze-Hou, parabolic loci for tuned coupled circuits, 672
Chanson, P., optics of e.s. lenses and proton microscope, 1746
Chapin, E. W., W. K. Roberts and M. C. Mobley, F.C.C. diathermy unit, 2587
Chapman, S., abnormal daily variation of H at Huancayo and in Uganda, 710; photochemistry of atmospheric oxygen, 1377; radial variation of earth's magnetic field, 380; solar magnetism and Blackett's theory, 1040
—— and K. K. Tschu, lunar atmospheric tides, 1382
Charles, D., electron optics of h.f. valves, 1559
Chaskin, W. S., carrier communication level regulator, 2332
Chatterjee, S. K., dielectric properties of ebonite and fibre at u.h.f., 743; dielectric properties of insulators at 750 Mc/s, 119
—— and — Rajeswari, dielectric constants of insulators at u.h.f., 118
—— and B. V. Sreekantan, absorption of u.h.f. waves in salt solutions, 1027, 1921; Type 833-A valve as u.h.f. oscillator, 48
Chaudhury, A. K., with others, horizontal electron microscope, 1747
Chauvierre, M., Paris television congress, 872; 1949 Paris fair, 2991
Chavasse, P., artificial voice, 1263
Chavigner, A., maintenance of long-distance underground lines, 1494
Cheatham, T. P., Jr, correlation functions and statistical theory of communications, (A)1785
Checcucci, P., with others, experiments in e.m. optics, 1647
Cheek, R. C., dual-conversion superheterodyne, 3244; power-line carrier communications, 213
Cheng, Kai Chia, with M. Born, theory of superconductivity, 68
Chenot, M., experimental investigations on the h.f. discharge, 2498
Cherry, C., Pulses and Transients in Communication Circuits, (B)2772
Cherry, E. C., analogies between waveguide e.m. fields and elastic-membrane vibrations, 3040; transformer equivalent circuits, 1613
—— with others, electrolyte tank for network-response measurements, 2743; pulse testing of wide band networks, (D)2862
Chesnut, R. W., wide-band carrier system, 514
Chien, Chi Kuang, with others, electronic mapping of activity of heart or brain, 1741
Chien, W. Z., theory of waveguides, 3335
Chilcot, A. L., and F. G. Heymann, potassium-activated cold-cathode valves, 3585
Child, R. B., Rural Radio Network programme development, 596
Chinn, H. A., and P. Eisenberg, sound reproduction, listeners' preferences, (D)2126
Chipman, R. A., with R. H. Campbell, Jr, noise from current-carrying resistors at 20–500 kc/s, 3067
Chireix, H., corrector circuits for feedback amplifiers, 1013; u.h.f. multiplex R/T links, 1597
Chistyakov, V. F., maximum of solar activity for current cycle, 1034
Chodorow, M., E. L. Ginzton and F. Kane, microwave impedance bridge, 2566
Chow Quantie, with others, ZnS phosphors, (C)1404
Christian, L., transistor, 914
Christaldi, P. S., specifications for c.r.o., (A)1713
—— with others, c.r.o. with 100-Mc/s bandwidth, (A)2563
Christiansen, W. N., D. E. Yabsley and B. Y. Mills, 60-cm solar radiation

during eclipse of 1st Nov. 1948, **3417**
Chrystie, H., with others, miniature sound-level meter, **2418**
Chrzanowski, P., with R. K. Cook, sound absorption by felt-covered spheres, **2123, 2419**
Chu, E. L., and W. W. Hansen, disk-loaded waveguides, **2139**
Chu, L. J., design of microwave aerials, **1291**; physical limitations of omnidirectional aerials, **1587**
Chugunov, S. S., with others, electronic frequency regulator, **2335**
Chynoweth, A. G., removal of space charge in diamond-crystal counters, **3215**
Cisney, E., with W. Parrish, X-ray diffraction camera, **1752**
Clammer, E. S., television station site testing, **3573**
Clapp, C. W., and C. L. Hackley, low-distortion a.f. oscillator, **(A)1612**
—— and R. V. Pohl, X-ray thickness gauge, **2579**
Clapp, F. D., cathode-follower design for r.f., **3102**
Clapp, J. K., frequency measurement by harmonics of v.f.o., **433**
Clark, A. C., with I. A. D. Lewis, meter for small voltages and currents **1996**
Clark, E. L., a.f.c. for television sweep circuits, **2336**
Clark, F. M., dielectric properties of impregnated cellulose, **747**
Clark, H. A. M., impedance and power meter for 144 Mc/s, **2835**
—— and P. B. Vanderlyn, double-ratio a.c. bridges with inductively coupled ratio arms, **(A)1126, 2850**
Clark, J. W., with others, exposure of animals to microwaves, **2284**
Clark, K. C., and others, effect of high altitude on speech, **622**
—— with others, effect of high altitude on threshold of hearing, **621**
Clark, T. C., with W. C. Lane, v.h.f. single-channel receiver for airports, **201**
Clark, W. R., W. R. Turner and A. J. Williams, Jr, square-law power-level recorder, **2572**
—— with others, stabilized d.c. amplifier, **2563**
Clausse, R., television broadcasting of meteorological charts, **(A)868**
Clavier, A. G., transmission efficiency and Hartley law, **2045**
—— P. F. Panter and W. Dite, effect of limiters on a.m./f.m. wave, **1505**; improvement of signal/noise ratio in p.c.m. system, **2325**
—— P. F. Panter and D. D. Grieg, distortion in pulse-count modulation, **758**
Cleaver, R. F., short-range m.c.w. position-finding system, **96, 1943**; single-receiver automatic Adcock direction finders for 100-150 Mc/s, **1078, 1940**
Clegg, J. A., location of meteor radiants by radar, **1031**
—— V. A. Hughes and A. C. B. Lovell, daylight meteor streams, May–Aug. 1947, **76**
Clement, P. R., h.f. transmission-line chart, **3045**
Coates, R. J., grating spectrometer for mm λ, **1131**
Cobb, L. M., W. L. Kershaw and Q. E. Erlandson, rectified a.c. system for aircraft, **1803**
Cocking, W. T., blocking oscillators, **2179**; receiver design for television station selection, **2933**
Cockrell, W. D., radar technique for register control in printing, **808**
Coe, J. C., telemetry for guided missiles, **805**
Cogniat, M., h.f. permeameter, **145**
Cohen, G. H., nonlinear-circuit analysis, **3077**
Cohen, H. G., with J. A. Bronzo, analogue-computer design, **1979**
Cohen, V. W., and A. Bloom, reduction of microphony in triodes, **(D)2963**
Cohn, S. B., electrolyte-tank measurements for microwave delay-lens media, **(A)1713**; metal-strip delay structure of microwave lenses, **2147**; wide-band waveguide filter, **2469**
Cohrt, E., with F. Heegaard, Copenhagen 'Broadcasting House', **222**
Coile, R. C., parabolic sound concentrators, **276**
Colbeck, W. R., harbour supervision radar, **2803**
Cole, R. H., and P. M. Gross, Jr, wide-range capacitance/conductance bridge, **2846**
Colebrook, F. M., radio u.h.f. measuring techniques, **(A)427**
Colebrook, W. A., with J. E. Benson, telecontrolled tunable receiver installation, **2884**
Coleman, C. F., with others, photoelectric acoustic spectograph, **1844**
Coler, M. A., conductive plastic materials, **(A)1681**
Coles, B. R., W. Hume-Rothery and H. P. Myers, structure and properties of alloy Cu_2MnIn, **1956**
Coles, D. K., microwave spectroscopy, **456**
Colin, J. E., classification of ladder-filter half-sections, **2748**
Colin, R. L., with P. C. Sandretto, design of multiple-function equipment for 960–1660 Mc/s, **(A)1672**
—— with others, review of radio navigation aids, **1399**
Colino, A., excitation of e.m. waves in cylindrical metal waveguides, **3039**
Collinge, B., reduction of dead-time in G-M counters, **1135**
Collins, D. L., miniature counter-tube power supply unit, **3266**
Collins, G. B., Microwave Magnetrons, **(B)588**
Collup, D. O., eliminating reflected-signal effects in pulsed systems, **1945**
Coltman, J. W., scintillation counter, **2582**
—— and F-H. Marshall, photomultiplier radiation detector, **460**
Cook, A., and L. L. Hall, Criggion radio station, **852**
Cook, A. C., and F. J. Maginniss, differential analyser applications, **3457**
Cook, L. E., with others, rural carrier-current telephony, **830**
Cook, R. K., properties of acoustic materials, **7**
—— and P. Chrzanowski, sound absorption by felt-covered spheres, **2123, 2419**
Cooke, D., pulse communication, **(D)1184**
Cooke-Yarborough, E. H., pulse-amplitude discriminator circuit, **1877**
—— C. D. Florida and C. N. Davey, quench circuit for G-M counters, **2457**
—— with J. L. Putman, measurement of dead-time in G-M counters, **1445**
Coolidge, A. W., Jr, thyratrons, **(A)572**; Type GL-5545 thyratron, **(A)1834, 2966**
Coombes, J. E. M., hydraulic remote position-controllers, **2329**
Coombs, J. M., number storage on magnetic tape, **421**
Coomes, E. A., and J. G. Buck, test-diode design, **2672**
Cooney, J. P., effects of ionizing radiation on tissue, **(A)1639**
Cooney, J. R., voice-controlled intercommunication system, **3541**
Coons, R. D., guided radar propagation in thunderstorms, **1478**
Cooper, A. H., television interference due to aircraft, **2068**
Cooper, C. P., Marconi TGS.571 transmitter, **553**
Cooper, R., spark-gap voltmeters, effect of short recurrent pulses, **783**
—— and W. A. Prowse, h.f. breakdown phenomena in gases, **(A)361**
Cooper, R. I. B., attenuation of u.h.f. e.m. radiation by rock, **(D)819**
Cooper, W. T., German scientific and technical publications today, **269**
Coppin, K. J., tracking in superheterodyne receivers, **1173**
Corbett, B. D., and A. J. Honour, timer for radioactivity measurement, **3210**
Corby, R. B., with M. A. Chaffee, radio control of Berlin air-lift, **3147**
Corfield, D. N., use of f.m. for amateur radio, **217**
Corke, R. L., with C. F. Floyd, crystal filters for radio receivers, **200**
Cornelius, P., rationalized Giorgi system of units, **1017, 1346**
Cornes, R. W., coaxial-line support for 0–4000 Mc/s, **1582**
Corrington, M. S., tracing-distortion in gramophone records, **2705**
—— with T. Murakami, amplitude and phase relations in networks, **1312**
Corson, D. R., and R. R. Wilson, particle and quantum counters, **168**
Cosslett, V. E., electron microscopy conference, Cambridge, Sept. 1948, **1749, 2882,** Delft, **3513,** London, 1948, **474**; electron microscopy developments in Britain, **182**
Costain, C. D., with P. O. Hawkins, a.m. of cm waves by electron beam, **3382**
Costrell, L., dead-time and recovery time in G-M counters, **2583**
Cotte, M., deviation at vertical incidence in ionosphere, **(D)2607**; field of plane electrode with elliptical hole, **1352**
Couanault, G., and P. Herreng, impedance irregularities of coaxial cables, **142**
Couch, W., activation mechanism for oxide cathodes, **3587**
Couch, W. M., Jr, scaler circuits, **2159**
Coudert, A., and A. Orlowski, television aerials, **955, 956**
Couillard, L., with P. Giroud, Decca navigator, **1401**
Courant, E. D., resonance effect in synchrotron, **3508**
—— and H. A. Bethe, e.s. deflection of betatron or synchrotron beam, **1159**
Coursaget, J., increase of voltage sensitivity of moving-coil galvanometers, **778**
Coursey, P. R., fixed resistors for communication equipment, **2735**
Courtney-Pratt, J. S., photographing fast transient phenomena, **2724**
Covington, A. E., circularly polarized 10.7-cm solar radiation, **2215**
Cowan, C. L., with others, ethylene-filled G-M counters, **164**
Cowan, F. A., modulation in communication, **836**
—— with others, rural carrier-current telephony, **830**
Cowcher, E., with others, quartz-crystal chronometer, **1113**
Cowley, J. M., and J. L. Symonds, electron diffraction and rectification from Si and pyrite surfaces, **1952**
Cowling, T. G., absorption of water vapour in far infra-red, **1349**
—— and R. Borger, electrical conductivity of ionosphere D region, **2085**
Cox, J. W., with R. W. Tremellen, wave propagation and s.w. communication, **(D)483**
Craggs, J. D., recent research on G-M counters, **1444**
—— with others, discharge spread in G-M counters, **163**; 20-MeV betatron, **179, (D)2014,** spectrum of X rays from, **180**
Crain, H. M., l.f. discriminator, **2742**
Crampton, C., direction finding, **(D)1066**
—— and H. S. Toczylowski, field strength estimation by means of h.f. direction finders, **1118**
—— R. T. P. Whipple and A. H. Mugridge, errors in h.f. d.f. bearings due to masts, **1074**
—— and others, h.f. d.f. in ships, **1063,** aerial systems for, **1075**
Crandell, C. F., with A. L. Samuel, waveguide bridge for measuring gain at 4000 Mc/s, **786**
Cravis, H., with others, vibrators for measuring pickup response, **775**
Crawford, A. B., radar reflections in lower atmosphere, **2300**
Creamer, A. S., with others, properties of Ba/Mg titanate dielectrics, **414**; properties of ceramic dielectrics, **2537**
Creamer, E. M., Jr, with W. P. Boothroyd, band-limited transmission systems, **(A)1785**; time-division multiplex system, **3258**
Cremer, L., acoustic boundary layer in front of rigid walls, **925**; analogies between angle-of-incidence and frequency problems, **3400**
Crocker, A. G., discriminator alignment, **199**
Croft, R. T., indicator for H_2S equipment, **1679**
Crosby, D. R., comparison of multiplex systems, **(A)1785**
Crosby, E. L., Jr, with H. Goldberg, series-mode quartz-crystal oscillator circuit, **333**
Crossley, A., and D. L. Elam, electronic measurement of pressure and displacement, **2589**
Crossley, W. P., with others, emission constant and apparent work function for oxide cathodes, **562**
Crouch, G. E., Jr, with W. H. Surber, Jr, microwave dielectric-constant measurements for solids, **1717**
Crout, P. D., Lagrange's equations and e.m. theory, **1646**
Crownover, J. W., with others, $BaTiO_3$ ceramics, **1087, 2533**
Croze, F., and P. Boillet, Huyghens' principle, **1463**
—— and É. Durand, formulae for Huyghens' principle, **1462**
—— and G. Darmois, unification of formulae for Huyghens' principle, **2022**
Croze, R., maintenance of long-distance underground lines, **1494**
Cuccia, C. L., electron coupler valve for a.m. and power control at u.h.f., **2975**; reactance-valve performance for f.m. at u.h.f., **2389**
—— and J. S. Donal, electron coupler, **(A)1824**
Cuénod, M., study of transient phenomena by means of time series, **3175**
Cullen, A. B., Jr, and J. H. Greig, resonant-cavity linear accelerator, **811**
Cullen, A. L., absolute power measurement for microwaves, **1727**; channel-section waveguide radiator, **2426**; measurement of microwave transmission efficiency, **3196**; slot offset from centre in rectangular waveguide, **1586**; transmission-line bridge, **(D)442**
Cunliffe, A., effect of waveform on rectifier-type instrument accuracy, **765**
Cunningham, W. J., nonlinear distortion in dynamic loudspeakers, **2135**; transient response of linear systems, **651**
Curling, C. D., with H. R. Allan, reflectometer, **1729**; resonant-cavity wavemeters for pulsed transmitters, **1130**
Currie, B. W., with others, auroral 3000-Mc/s radiation, **3139**
Cutolo, M., magneto-ionic theory of gyro-interaction, **1476**
—— and R. Ferrero, gyro-interaction, **1477, 1767**
Cutrona, L. J., theory of receiver noise figure, **(A)1769**

D

Dagnall, C. H., and P. W. Rounds, delay equalization of carrier circuits with 8-kc/s bandwidth, **2906**
Dailey, B. P., microwave absorption spectra and chemical analysis, **2504**
Dailey, H. J., surge testing of high-vacuum valves, **2661**
Dakin, T. W., and C. N. Works, microwave dielectric measurements, **2557**
Dallenbach, W., skin effect in conductors and in insulators with conducting surface layer, **3402**
Dalman, G. C., effect of oxide-cathode properties on diode operation for small signals, **(A)1824**
Dana, H. J., air-speed and precipitation charging, **2622**; high-altitude corona and radio interference, **363**
Danforth, W. E., and D. L. Goldwater, resistance of BaO and SrO cathode coatings for high pulse emission, **2093**
Danielson, G. C., B. T. Matthias and J. M. Richardson, dielectric behaviour of $BaTiO_3$, **746**
Danzin, A., and E. Despois, use of optical polish in valve construction, **1539**
Darmer, K. F., variable room-acoustics, **3016**
Darmois, G., with F. Croze, unification of formulae for Huyghens' principle, **2022**
Das, A. K., solar prominences in 1947, **1038**
Das Gupta, N. N., and others, horizontal electron microscope, **1747**
Dash, E. M., with J. E. Benson, quartz-crystal chronometer, **1113, 3183**
Daudt, W., RC equalizers for a.f. amplifiers, **1271**
Davey, C. N., with others, quench circuit for G-M counters, **2457**
Davey, J. R., and A. L. Matte, frequency-shift telegraphy, **840**
Davies, B. R., and L. W. Brown, design of marine radar equipment, **2083**
Davies, H., high-fidelity disk recording, **(D)942**
—— with P. E. Axon, measurement of wow, **1570**
Davies, J. A., quality control in valve manufacture, **2374**
Davies, J. G., and C. D. Ellyett, diffraction from meteor trails and measurement of meteor velocities, **2508**
Davies, J. W., H. W. B. Gardiner and W. H. Gomm, technique of radio valve manufacture, **2085, (A)2947**
—— with J. Bell, development of transmitting valves, **3301**
Davis, H., approach and landing systems, **(A)1672**
Davis, M. E., with C. L. Pekeris, microwave transmissions at San Diego under duct conditions, **2610**
Davis, R. C., with others, v.h.f. airborne navigational receiver and aerial system, **(A)1672**
Davis, W. L., and C. E. Warren, calibration of peak voltmeters, **781**
Davis-Berry, R., electromechanical and electronic calculating machines, **2544**
Davison, G. N., and R. J. Pickard, multichannel radiotelegraph equipment, **883**
Day, J. R., serrasoid frequency modulator, **342, 2363**
De, M. L., with others, horizontal electron microscope, **1747**
De Barr, A. E., efficiency of radiation shields, **1021, (D)1350**
Debiesse, J., with others, use of radioactive elements for study of oxide cathodes, **2598**
Dechend, W., range of infra-red rays, **1020**
Decker, K. M., with others, solar noise at 9500 Mc/s and coincident flare, **697**
Deeley, E. M., and D. M. MacKay, electronic-analogue multiplication and division, **1977**
Deerhake, F. M., New York/Schenectady television relay, **2347**
Dehn, R. A., dyotron as v.h.f. oscillator, **(A)2676**
Delaby, H., Principes Fondamentaux de Télévision, **(B)1218**; technical and production problems in television, **(A)890**
Delbord, Y. L., cinematographic recording using television, **(A)877**; reasons for choice of 819-line television standard, **2345**
Delestrade, C., with R. Grandmontagne, colour variations of night sky, March 1947–May 1948, **1387**
Dellinger, J. H., Radio Technical Commission for Aeronautics, **(A)1672**
Deloraine, E. M., pulse modulation, **2636**
Delvaux, J. L., definition in cinematograph films and in television, **(A)876**; theoretical basis of television line-standard selection, **2346**; 729-line television equipment, **(A)873, 2927**
Delyon, G., and M. Manière, stabilized oscillator for multiplex telegraphy, **209**
Demars, P. A., with R. M. Wilmotte, polycast u.h.f. television transmission system, **2056**
Demeshina, A. L., with G. I. Skanavi, polarization and losses in polycrystalline dielectrics, **1971**
Demontvignier, M., and P. Lefèvre, stability criteria for linear systems, **3127**
Dench, E. C., with A. C. Hardy, electronic method of solving nonlinear simultaneous equations, **1705**
Denis, M., and B. Epstein, frequency measurement to 40 kMc/s, **1725**
Denisse, J. F., correlation between sunspots and 10.7-cm solar radiation, **2511**
Dennis, F. R., and E. P. Felch, reactance-valve modulation of phase-shift oscillators, **(A)1612**
Department of Scientific and Industrial Research, Radio Research Special Report No. 18: Application of Ionospheric Data to Radio Communication, **(B)825**
Deryugin, L. N., critical frequencies of π and H waveguides, **1285**
Deschamps, G. A., geometrical representation of polarization of plane e.m. wave, **(A)1639**
Despois, E., with A. Danzin, use of optical polish in valve construction, **1539**
Destrian, G., electrophotoluminescence, **110**
Dettinger, D., with H. A. Wheeler, measuring efficiency of superheterodyne converter, **(A)1713, (B)3314**
DeTurk, J. E., with C. F. West, digital computer for scientific applications, **1107, (D)3178**
Deutschmann, W., phase and group transmission times and their measurement, **1115**
Devereux, R. C., London overseas R/T exchange, **218**
DeVore, H. B., and H. Iams, microwave optics between parallel conducting sheets, **1292**
Dewey, G. C., periodic-waveguide travelling-wave amplifier, **(A)2667**
DeWitt, J. H., Jr, and E. K. Stodola, radio signals reflected from moon, **1937**
Dice, J. W., location of internal defects by ultrasonics, **2286**
Dicke, R. H., electronic fluxmeter, **435**
—— with others, Principles of Microwave Circuits, **(B)1636**
Dickerson, A. F., hum-reduction circuits, **(A)2496**
Dickey, E. T., with others, Frequency Modulation, Vol. 1, **(B)529**; Radio at Ultra High Frequencies, Vol. 2, **(B)923**
Dickey, F. R., Jr, with others, extraction of weak signals from noise by integration, **2612**
Dickey, J., with others, photoelectric emission and contact potentials of semiconductors, **1098**
Dickinson, T. A., electrets, **3359**
Dickson, D. C., Jr, C. T. Zavales and L. F. Ehrke, high-speed X-ray motion picture system using radar techniques, **(A)1733, 2600**
Dickson, F., grid current and neutralization, **1831**
Dieminger, W., ionosphere over mid-Germany, Jan.–Oct. 1948, **1475,** Jan. 1949, **1661,** Feb. 1949, **1934,** March 1949, **2518,** April 1949, **2519,** May 1949, **2792,** June 1949, **3131,** July 1949, **3425**
—— and H. G. Möller, magnetic triple splitting in ionosphere, **2791**
Dietrich, E., intelligibility impairment by noise in dm-wave links, **2623**
Dillenburger, W., l.f. amplification in wide-band amplifiers, **3109**
Dimmick, G. L., and S. W. Johnson, optimum high-frequency bias in magnetic recording, **635, 3031**
Dimock, P. V., with others, 0-channel mobile system, **(A)1785**
Dishal, M., design of band-pass networks with coupled resonant circuits, **(A)1612**; design of dissipative band-pass filters, **3369**
—— and H. Morrow, band-pass circuit design for minimum d.f. bearing error, **(A)1672**
—— with H. Busignies, speed of indication, bandwidth and signal/noise ratio in radio navigation and d.f., **2232**
Dishington, R. H., diode-circuit analysis, **2151**
Dite, W., with P. F. Panter, distortion in pulse-count-modulation system, **(A)1785**; negative feedback in f.m. systems, **3548**
Dite, W., with others, effect of limiters on a.m./f.m. wave, **1505**; improvement of signal/noise ratio in p.c.m. system, **2325**
DiToro, M. J., broad-band bolometer-type u.h.f. power meters, **(A)461**; transient response of linear networks with amplitude distortion, **(A)1612**
Diven, L., with others, crosstalk in time-division multiplex systems, **(A)1785**
Divoire, E., Wien-bridge RC a.f. oscillator, **1624**
Dodington, S. H., crystal control at 1000 Mc/s for aerial navigation, **(A)1672**
Doehler, O., crystal detectors, **2760**; properties of magnetrons, **261**
—— and W. Kleen, travelling-wave valve, effect of space charge in, **251,** efficiency of, **2953,** nonlinear phenomena in, **250,** theory of, **2369, 2381, 2669**
—— W. Kleen and P. Palluel, travelling-wave valves as wide-band oscillators, **1830**
—— with J. Brossart, travelling-wave valve with magnetic field, **1544**
—— with others, amplification in double-beam valve, **2977**
Doherty, W. H., a.m. transmitter performance with sharply-tuned aerials, **3291**; Doherty linear amplifier in American broadcasting, **1343**
Döhler, O. See Doehler, O.
Donal, J. S., and R. R. Bush, spiral-beam method for a.m. of magnetrons, **2401**
—— with C. L. Cuccia, electron coupler, **(A)1824**
Donnelly, A. V., microwave frequency stabilization, **136**
Dorf, R. H., Practical Disk Recording, **(B)1577**
Dorgelo, E. G., glass transmitting valves for 100-Mc/s range, **2665**; sealing for transmitting-valve leads, **1975**
Döring, H., klystrons, **2402**
van Dorsten, A. C., voltage stabilization for electron microscope, **1895**
Dosse, J., betatron, **2291**
Douma, T., commutation in rectifiers using relay tubes, **2053**; voltage surges in rectifiers started without load, **1870**
Dowell, K. P., thermistors, **3354**
Downes, J. G., Australian distance-measuring equipment and multi-track radar range, **2527**
Downes, L. C., and J. F. Wiggin, shutterless television film projector, **1212**
Downey, T., a.m. and f.m. station measurements, legal requirements, **2859**
Dranetz, A. I., G. N. Howatt and J. W. Crownover, $BaTiO_3$ ceramics, **2533**
—— with others, piezoelectric $BaTiO_3$, **1087**
Dresel, L. A. G., L. A. Moxon and E. E. Schneider, direct-reading noise-factor meter, **794**
Dreyer, J. F., Jr, television field-strength surveys, **3525**
Drobov, S. A., reactive trigger circuits, **2739**
Drozhzhina, V. I., M. G. Luzhinskaya and Ya. S. Shur, magnetic structure of alnico, **1965**
Duchesne, M., electron-optics of immersion objective, **2597**; residual current in sensitive photocells, **1225**
Duesden, F., aids in sketching field-strength diagrams, **3344**
Duerdoth, W. T., phase meter for frequency band 100 kc/s–20 Mc/s, **2902**
—— and J. Garlick, miniature a.f. amplifier, **1341**
Duffell, P. J., with N. M. Best, indoor television aerial, **2719**
Dufour, J., first practical television tests in Switzerland, **2352**
Duke, V. J., with D. S. Bond, ultrafax facsimile system, **2055, 2340**
Dummer, G. W. A., radar training devices, **2230**
Dunbar, A. S., calculation of doubly curved reflectors for shaped beams, **311**
—— and M. D. Adcock, measurement of gain of horn aerials, **1806**
Duncan, P. F., radar for weather forecasting, **385**; theory of error distribution, **1939**
Duncan, R. A., with E. Friedlander, frequency correction of railway signalling power supplies, **3265**
Dunlap, O. E., Jr, Radar: What Radar is and How It Works, **(B)407**
Dunlap, W. C., Jr, Ge and transistor, **1968**
—— and E. F. Hennelly, non-rectifying Ge, **748**
Dunover, L., bridge manometer for low pressures, **1084**
Dupuis, F., broadcasting at 5th Olympic winter sports, St. Moritz, 1948, **2328**
Dupuis, L., fault finding in underground cables, **290**
Durand, É., diffraction of plane light waves by black screens, **2779**; series developments for retarded potentials, **2208**
—— with F. Croze, formulae for Huyghens' principle, **1462**
Durand, P., aerial impedance measurement in aircraft, **2270**
Durkee, A. L., with others, broad-band mircowave relay system New York/Boston, **1793**
Duryee, L. M., economic aspects of r.f. heating, **2590**
Dushman, S., Scientific Foundations of Vacuum Technique, **(B)3174**
van Duuren, H. C. A., radio teleprinting, **1501**
Dwight, H. B., Bessel-equation roots for calculating cavity-resonator frequencies, **417**
Dyott, E. G., Jr, with others, miniature sound-level meter, **2418**

E

Earp, C. W., theory of communication, **62**
—— and R. M. Godfrey, d.f. by cyclical differential measurement of phase, **1050, 2233**
East, T. W. R., and A. F. Standing, circular timebase frequency comparator, **2354**

Easton, A., stagger-peaked video amplifiers, **1344**
Eastwood, E., and K. A. Mercer, transient radar echoes from ionosphere, **89**
Eaton, N. F., *K*-indices and *C*-numbers, April–June 1948, **1042**
Eberhard, E., with others, circuits for the transistor, **1906**
Ebert, H., and J. Gielessen, pressure and temperature coefficients of resistance of certain alloys, **3173**
Ebert, J., with others, broad-band signal generator, **2576**
Eckart, C., approximate solution of one-dimensional wave equations, **2602**
Eckart, G., and T. Kahan, internal reflection of e.m. waves in stratified medium, **2605**; radiation of dipole above plane earth, **951**
Eckart, G., with T. Kahan, propagation in atmospheric duct, **1466** **1467**; propagation of e.m. waves above ground, **2892**
Eckersley, T. L., coastal refraction, **1469**; critical frequency near *r* = 1, **715**; observations of scatter clouds, **84**; studies in propagation, **1473**
Eckert, J. P., Jr, H. Lukoff and G. Smoliar, dynamically regenerated memory tube, **(A)1703**
—— with J. W. Mauchly, electronic computers, **(A)419**
—— with others, Hg delay-line memory, **3082**
Eder, F. X., electrical properties of ice, **3191**; region between mm waves and long-wave infra-red, **1026**
Edmundson, D., magnetic sheet steel, **756**
Edson, J. O., with H. S. Black, p.c.m., **842**
Edwards, A., permanent magnets, **3170**
Edwards, B. J., television standardization for Europe, **1524**
Edwards, F. E., Jr, control of clutch-type servomechanisms, **2641**
Edwards, W. D., with K. A. Macfadyen, dielectric strength of liquids for short voltage pulses, **1694**
Egidi, C., comparison of standard time signals, **1428**; surface hardening of metals by means of h.f. induction currents, **2885**
—— and G. Gregoretti, reception of WWV standard-frequency signals at Turin, **135**
Ehrenberg, W., and R. E. Siday, refractive index in electron optics, **1455**
—— with F. Ansbacher, electron-bombardment conductivity, **3404**
Ehrenhaft, F., and R. Herzog, effect of magnetic field on radiation from Ra-E, **694**
Ehrke, L. F., with others, high-speed X-ray motion picture system using radar techniques, **(A)1733**, **2600**
Eiby, G. A., time-service equipment at Dominion Observatory, N.Z., **1711**
van den Eijk, J., with others, absorption of sound by porous materials, **1569**
Einstein, P. A., and L. Jacob, electron-optical immersion objective, **183**
Eisele, E., with H. Wilde, magnetostrictive acceleration meter, **2867**
Eisenberg, P., with H. A. Chinn, sound reproduction, listeners' preferences, **(D)2125**
Eisenstein, J. C., with others, effect of high altitude, on speech, **622**, on threshold of hearing, **621**
Elam, D. L., with A. Crossley, electronic measurement of pressure and displacement, **2589**
Elder, F. R., and others, 70-MeV synchrotron, **2594**
Eldred, W. N., a.f. signal generator, **2857**
—— with W. B. Wholey, new type of slotted-line section, **(A)2716**
Eldredge D. H., and H. O. Parrack, biological effects of intense sound, **(A)933**
Electronics, airborne magnetometer, **477**; automatic process control, **3503**; close-spaced microwave triode, **2390**; coaxial transistor, **2407**; c.r. tubes with metal shell, **575**; J.T.A.C., purpose and programme, **589**; Markite conductive plastics, **3443**; microwave secondary-emission switch, **3358**; miniature reflex oscillator for 2–12 kMc/s, **2879**; r.f. mass spectrometer, **797**; tabulated properties of various materials, **3167**; television in an air-liner, **1209**; television crosshatch generator, **1133**; thyratron d.c./a.c. converter, **3263**; ultrafax facsimile system, **1203**
Ellickson, R. T., with others, inertia effects in infra-red-sensitive phosphors, **1950**
Elliot, H., effect of external quenching on life of argon-alcohol counters. **2874**
Elliott, A., h.v. dry voltaic (Zamboni) pile, **862**
Ellis, G. B., thermoelectric generator design, **1806**
Ellis, S. G., with J. Hillier, illumination system of electron microscope, **3511**
Ellison, M. A., solar flares and terrestrial effects, **2512**
Ellyett, C. D., with J. G. Davies, diffraction from meteor trails and measurement of meteor velocities, **2508**
El-Mawardi. See Mawardi.
Elmore, W. C., transient response of damped linear networks, **653**
El-Said, M. A. H., multiplying circuits and wattmeters, **3361**
Elsasser, W. M., non-uniformity of the earth's rotation and geomagnetism, **1656**
Elson, N., ground-wave propagation across land/sea boundary, **3233**
Eltgroth, G. V., performance of superregenerative receivers, **2617**
Emde, F., Tafeln elementarer Funktionen, **(B)2828**
—— with — Jahnke, Tafeln höherer Funktionen, **(B)2826**
Emeléus, H. J., fluorine chemistry, **736**
Emslie, A. G., with others, extraction of weak signals from noise by integration, **2812**
Endall, R., with O. Read, recording and reproduction of sound, **632**
Endt, P. M., with H. A. van der Velden, fluctuation problems for G-M counters, **1138**
—— with others, a.c. galvanometer, **3199**
von Engel, A., with E. W. B. Gill, starting potentials of electrodeless discharges, **2500**
Engel, H., measurement of earth resistance, **1716**
England, T. S., and N. A. Sharples, microwave dielectric properties of human body, **2282**
English, W. N., and L. B. Loeb, point-to-plane corona onset potential, **3405**
—— with D. B. Moore, point-to-plane impulse corona, **2499**
Engstrom, R. W., and A. R. Moore, admittance of microwave switch Type 1B23, **3071**
Enkel, F., simple method of distortion measurement, **2577**
Épelboim, I., anomalies of ferromagnetics at r.f., **72**; permeameters with demountable coils, **147**, **(C)774**
Eppelsheimer, D. S., with F. A. Hames, ferromagnetic Cu-Mn-Ga alloys, **1406**
Epperson, J. B., WEWS television aerial, **954**
Epstein, Benjamin, and H. Brooks, theory of extreme values and dielectric strength of paper capacitors, **1308**
Epstein, B., with M. Denis, frequency measurement to 40 kMc/s, **1725**
Erde, B., colour-television film scanner, **869**
Erdman, D. C., ultrasonic flaw detectors, **804**, **1447**
Erikson, P. E., 1947 Atlantic City telecommunication convention, **1499**
Erlandson, Q. E., with others, rectified a.c. system for aircraft, **1808**
Ernsthausen, W., sound field of aircraft propeller, **2687**
Erayel, H. H., modulation of television transmitters and cathode excitation, **(A)684**
Eshbach, E. A., with others, 100-W 1000-Mc/s grounded-grid triode, **569**
Espley, D. C., transient network distortion, **(A)652**
—— E. C. Cherry and M. M. Levy, pulse testing of wide-band networks, **(D)2862**
Essen, L., with L. Hartshorn, radio standards, **(A)452**, **1715**
Evans, H. J., permittivity and power factor at 100 Mc/s of ceramics at high temperature, **3466**
Evans, J. H., crystal rectifiers at u.h.f., **25**, **2761**; measurement and suppression of interference, **1781**
Evans, L. W., with others, $CaSiO_3$-Pb and $CaSiO_3$-(Pb + Mn) phosphors, **735**
Evtyanov, S. I., equivalence of h.f. and l.f. amplifiers, **675**; theory of self-oscillator with quartz crystal, **2474**
Ewing, D. H., with others, teleran, **404**
Ewlin, F. L., with others, design of high-power modulation transformers, **953**

F

Fagot, J., h.f. wide-band transmitter amplifiers, **(A)674**
Fairhurst, H., reduction of interference with television sound, **1179**
Fairweather, D., and N. J. Beane, frequency/temperature relationships of l.f. quartz plates, **1965**
Falckenberg, G., and F. Lauter, space-wave absorption and large-scale weather conditions, **2037**
Falkenhagen, H., ultrasonics and electrostriction, **1843**
Fan, H. Y., emission of sintered thoria-tungsten cathodes, **2588**; theory of rectification by insulating layer, **1098**
Fano, R. M., broad-band matching of impedances, **326**
Fanselau, G., geomagnetic activity at Niemegk, 1946, **(A)712**; geomagnetic parameters from limited-area observations, **(A)705**
Farkas, F. S., F. J. Hallenbeck and F. E. Stehlik, filters and phase-simulating network for carrier system, **2752**
Farley, C. G., paper capacitors using chlorinated impregnants, **3072**
Farmer, E. C., and S. C. Brown, deterioration of methane-filled G-M counters, **801**
Farmer, W. J. R., electronic voltage regulator, **2646**
Fassbender, J., photoelectric properties of CdS single crystals, **3440**; reproducing device for scanning optical sound-tracks, **2420**
Faulkner, M., radio communication developments in Great Britain, **1498**
Faulkner, R. D., and J. C. Turnbull, envelope of a metal kinescope, **(A)1824**
—— with H. P. Steier, manufacture of R.C.A. c.r. tubes Type 16AP4, **2341**
—— with others, 16-in. metal kinescope for television, **2399**
Fauve, C., with others, efficiency of v.m. valves, **1558**
Favre, M. G., 10-kW s.w. telegraphy transmitter, **245**
Fawcett, C. H., with A. J. Baggott, development of magnetic and acoustic mines, **(D)1450**
Fay, R. D., interactions between plate and sound field, **606**, **(C)2117**
Feaster, G. R., pulse emission decay in oxide cathodes, **2671**
Featherstone, R. P., with others, c.r.o. with 100-Mc/s bandwidth, **(A)2568**
Fechner, P., with J. Ortusi, geometrical representation of characteristics of active obstacle in waveguide, **2140**
Fehr, E. B., colour measurement and specification in television picture tubes, **538**
Feigs, H., chain amplifier, **2485**; gyrator, new circuit element, **3075**
Feinberg, R., multivibrators, symmetrical, **2181**, theory of, **50**
Feinstein, L., microphony, **(A)1824**
Feit, L., with others, crosstalk in time-division multiplex systems, **(A)1785**
Fejer, J. A., pulse amplification by gating methods, **2189**
Felch, E. P., and others, airborne magnetometers, **815**
—— with F. R. Dennis, reactance-valve modulation of phase-shift oscillators, **(A)1612**
Feld, Ya. N., diffraction aerials with axial symmetry, **3049**; multi-slot aerials, **957**; potential distribution along slots, **3044**; radiating surface systems, **3048**
Feldman, C. B., 96-channel p.c.m. system, **516**
Feldman, W., with others, television recording camera, **236**
Feldt, R., luminescent screens for c.r.o., **(A)445**
—— with C. Berkley, c.r. tube applications in photography and optics, **(A)2596**, **3226**
Feldtkeller, R., hysteresis and eddy currents in Si/Fe and Ni/Fe alloys in weak a.c. fields, **1686**; permeability and eddy currents in sheet-metal cores at v.h.f., **2808**
Feleci, N. J., high-power e.s. generators, **2337**
Felker, J. H., design chart for television i.f. coils, **2737**
Fellgett, P. B., dynamic impedance and sensitivity of radiation thermocouples, **3484**
Felsenheld, R. A., with others, high gain with discone aerials, **303**
Fenn, W. H., standard dimensions for waveguides, **2861**
Fenton, A. G., and E. W. Fuller, experiments with adjustable G-M counter, **1443**
Feofilov, P. P., polarized luminescence, **2203**
Ferrell, O. P., sporadic-E clouds and amateur research, **1666**
Ferrer, H. J., with O. M. Ashford, Meteorological Office radar reflector Mark IIB, **1735**
Ferrero, R., with M. Cutolo, gyro-interaction, **1477**, **1767**
—— with A. Pinciroli, equivalent circuit and input admittance of retarding-field valve, **1311**
Ferris, W. R., characteristics of diodes with oxide cathodes, **2099**
Feuer, P., and E. S. Akeley, scattering by resonant ring in circular waveguide, **640**
Fichter, R., Mg dry batteries, **533**
Fidelman, D., electronic analogue computers, **2824**; electronic computer applications, **2886**
Field, L. M., slow-wave structures for travelling-wave valves, **2088**
Fielding, E. C., aircraft communication set Type A.R.I.5272, **1511**
Fiet, O. O., 8-bay pylon aerial, **304**, for 1200-kW f.m. radiation, **864**
Filosofo, I., with A. Rostagni, radiometer vacuum gauge, **2240**
Finch, T. R., visual testing equipment for wide-band networks, **(A)1713**
Fink, D. G., international television standards, **3567**; trends in electronic engineering, **2987**
Finlon, F. P., motional impedance of magnetostriction elements, **2116**
Finney, W. J., reflection of sound from submerged plates, **611**
Fischer, F., c.r. tube screens for television projection in cine-theatres, **3562**
Fischer, F. A., classification of electroacoustic transducers, **940**; coupled acoustic oscillators and resonators, **1841**; electroacoustic energy transformation, **3320**; spectral distribution of periodic and non-periodic phenomena, **1701**
Fischer, F. P., analysis of oscillator frequency instability, **(A)336**
Fischer, J., old and new electrical units, **3399**; permanent magnets, **3452**
Fishenden, R. M., and E. R. Wiblin, design of Yagi aerials, **1603**
Fisher, J., propagation tests at u.h.f., **(A)1757**, **3526**; television standard-signal distribution system, **1984**
Fishman, M., with others, analysis of magnetic amplifiers, with feedback, **(A)2448**, **3064**, without feedback, **(A)2447**, **3351**
Fitch, E., spectrum of modulated pulses, **(D)1789**
—— with Z. Jelonek, pulse communication, **(D)1184**
—— with B. Starnecki, mutual impedance of centre-driven parallel aerials, **2295**
Fitzgerald, A. S., feedback in magnetic amplifiers, **2731**
FitzGerald-Lee, G., magnetic materials, **750**; powder metallurgy, **1973**
Fleck, J. T., with others, synthesis of RC lattice structure, **(A) 1612**
Fletcher, H., reducing polarization error of U-Adcock direction finder, **1062**
Florida, C. D., with others, quench circuit for G-M counters, **2457**
Florman, E. F., and A. Tait, electronic phase meter, **1726**
Flory, L. E., with others, reading aids for the blind, **2593**, **2877**
Floyd, C. F., and R. L. Corke, crystal filters for radio receivers, **200**
Flury, H., with others, electrical conductivity and refractive index of $BaTiO_3$, **(A)1091**
Fock, V. A., approximate solutions for diffraction problems, **817**
Foldy, L. L., theory of passive linear electroacoustic transducers, **(A)939**
Foley, A. H., self-balancing capacitance bridge, **785**
Fonda, G. R., and F. Seitz, Preparation and Characteristics of Solid Luminescent Materials, **(B)126**
Ford, L. H., effect of humidity on precision air capacitors, **978**, **1611**; modification of Astbury's method of measuring inductances, **1999**
Forster, E., with others, carrier frequency-shift telegraphy, **(D)1180**
Forster, W. H., inter-city television radio relays, **1185**, **(A)1785**
Försterling, K., propagation of e.m. waves in ionosphere, **3518**
Forsyth, P. A., W. Petrie and B. W. Currie, auroral 3000-Mc/s radiation, **3139**
—— with other, auroral displays at Saskatoon, Jan./Feb. 1949, **2522**
Fortescue, R. L., h.v. e.s. generator at A.E.R.E., **2018**
Foster, H. G., with others, interaction of radio waves in the ionosphere, **194**
Foster, R. M., topology of networks, **(A)1612**
Fouty, R. A., with C. E. Smith, circular polarization in f.m. broadcasting, **328**
Fowler, D., with H. E. Taylor, v.h.f. helical aerial design, **1861**
Fox, E. N., diffraction of sound pulses at slit in reflecting screen, **2417**
Fox, F. E., and V. Griffing, ultrasonic intensity gain due to concave reflectors, **3005**
—— and J. L. Hunter, ultrasonic interferometer with resonant liquid column, **930**
—— with V. Griffing, ultrasonic intensity gain due to concave reflectors, **3004**
Fox, S., with R. Weissman, h.v. supplies for radiation-measuring equipment, **(A)1800**
Fradin, A. Z., and V. A. Khatskelevich, effect of asymmetry in Adcock aerial systems, **1293**
France, B., ériscope television camera tube, **537**
Frank, J. M., and W. S. Huxford, properties of infra-red Cs arc, **512**
Frank, K., and K. Raithel, high-resistance PbS layers, **3296**
Frank, N. H., with J. C. Slater, Electromagnetism, **(B)75**
Frank, W., acoustics of Prague theatres and concert halls, **3015**
Franke, I., and M. Huot de Longchamp, production of large quartz crystals, **1964**
Frankel, S., high-impedance cable, **2137**; multi-conductor transmission lines, **1282**; resonant-section band-pass filters, **2170**; TM_{01} mode in circular waveguides, **16**
Frankenhauser, B., and D. N. C. MacDonald, galvanometer amplifier, **2344**
Franz, K., reflection in rectangular waveguide, at capacitive diaphragm, **347**, at change of cross-section, **1858**
Franz, W., theory of diffraction, **3118**
Fraser, D. B., noise spectrum of temperature-limited diodes, **2097**
Fredendall, G. L., with R. D. Kell, standardization of transient response of television transmitters, **2063**
Freedman, S., controlled voltage divider, **2453**
Freeland, E. C., f.m. receiver design problems, **1169**
Freeman, J. J., noise spectrum of diode with retarding field, **2098**
—— with R. E. Grantham, microwave attenuation standard, **(A)1730**, **2578**
de Fremery, F., rotating-field beacons, **1946**
French, H., with M. Silver, studio/transmitter radio link using klystrons, **226**
—— with others, video design considerations for television link, **(A)1785**
Frerichs, R., electrical properties of incomplete phosphors, **109**
Frey, J., frequency multiplication, **2175**
Fricke, H., goniometer arrangement for suppression of interfering transmissions, **2242**
Friedberg, Z., telecommunications in petroleum industry, **1783**
Friedenstein, H., S. L. Martin and G. L. Munday, mechanism of emission from oxide cathodes, **253**
Friedland, S. S., life of self-quenching G-M counters, **800**
Friedlander, E., and R. A. Duncan, frequency correction of railway signalling power supplies, **3265**
Friedman, H., G-M counters, **3211**
Friend, A. W., charts for determining tropospheric refractive index, **3422**; tropospheric sounding by radar, **1760**
Friis, R. W., with others, broad-band microwave relay system New York/Boston, **1793**
Frissel, H. F., with others, determination of elastic constants for β-quartz, **738**
Fritsch, V., radio prospecting methods, **187**
Fröberg, C. E., calculation of potential from asymptotic phase, **2776**
Fromageot, A. P. A., phase constants and group velocity in television, **(A)682**
Frosch, C. J., with others, attenuator materials for microwaves, **1691**, **2535**
Fry, D. W., synchrotron for medical use, **3224**
—— and others, travelling-wave linear accelerator for 4-MeV electrons, **1148**
Fry, F. J., and W. J. Fry, ultrasonic detection of infra-red radiation, **273**
Fry, W. J., double-crystal acoustic interferometer, **1257**; low-loss crystal systems, **1326**, **(C)2136**
—— with F. J. Fry, ultrasonic detection of infra-red radiation, **273**
Fubini, E. G., and D. C. Johnson, signal/noise ratio in a.m. receivers, **(A)501**, **1176**
—— with W. R. Aylward, electronic multi-couplers, **(A)1612**
Fuchs, G., attenuation and phase distortion in coaxial cables, **14**
—— and V. Baranov, attenuation and phase distortion and their effect on television signals, **(A)654**, **1871**
Fuller, E. W., with A. G. Fenton, experiments with adjustable G-M counter, **1443**
Fünfer, E., electrical and optical phenomena in spark breakdown in gases, **1918**
Furrer, W., A. Lauber and P. Werner, transmission of wide a.f. band, **1787**
Fürstenberg, A. I., measurement of Z, C, L and f by proportional currents, **3185**

G

Gabor, D., new possibilities in speech transmission, **(D)274**
Gainsborough, G. F., sources of error in microwave milliwattmeters, **(D)2274**
Gale, H. M., and P. D. Atkinson, magnetic amplifiers, **(A)871**, **2729**
Gales, R. S., with T. H. Schaffer, masking of multiple tones by noise, **3011**
Galmiche, C., stability criteria for servomechanisms, **1193**
Gama, L. I., magnetic effects during solar eclipse, 20th May 1947, **1041**
Gamara, N. J., with others, High Frequency Measuring Techniques using Transmission Lines, **(B)2866**
Gänger, B., h.v. voltmeter, **3475**
Gannett, D. K., and W. R. Young, frequency and phase swing in f.m. and ph. m. systems transmitting speech, **2048**
Gannett, J. K., heating and ventilation of KOMO studios, **1189**
Gardère, H., effect of filtering on telegraphy distortion, **2751**
—— and J. Oswald, crosstalk in multiplex pulse systems, **224**
Gardiner, H. W. B., with others, technique of radio valve manufacture, **2085**, **(A)2947**
Garelli, C. M., with M. Abele, rectangular waveguides with several dielectrics, **1288**
Garfield, O. R., pulse-length distribution analyser, **132**
Garlick, G. F. J., mechanism of luminescence in phosphors, **(D)2807**; physics of c.r. tube screens, **3158**
Garlick, J., with W. T. Duerdoth, miniature a.f. amplifier, **1341**
—— with D. G. Tucker, selective transmission-measuring equipment, **767**
Garner, W. R., loudness matching of short tones, **3013**
—— with G. A. Miller, masking of tones by repeated bursts of noise, **623**
Garrison, J. B., and A. W. Lawson, efficiency of radiation shields, **1022**
Garrod, R. I., and K. A. Gross, vacuum gauge for 10^{-4} to 10^{-5} mm Hg, **730**
Garton, C. G., developments in insulating materials, **2815**
Garven, K. M., with J. C. Stewart, universal curves for band pass filter calculations, **2749**
Garvey, R. J., electrical remote position-indicating systems for aircraft, **2329**
Gast, T., automatic compensation, **171**
—— and E. Alpers, dielectric measurements by balance methods, **1431**
Gastebois, J., French telecommunications networks, **1492**
Gatti, E., quasi-aperiodic frequency divider for low a.f., **1336**
Gauster-Filek van Wittinghausen, W., sound ray geometry for stratified media, **2986**
Gautier, T. N., with A. G. McNish, lunar and midday effects in ionosphere at Huancayo, **3426**
Gavin, M. R., f.m. of oscillator, **330**; v.h.f. valves and circuits, **337**
—— with others, u.s.w. triode oscillators, **(D)338**
Gavrilov, F. F., with F. I. Vergunas, ZnO and ZnS-Zn phosphors, **1683**
Gebhardt, R. E., Cheltenham *K* indices, Oct.–Dec. 1947, **379**, Jan.–June 1948, **706**
Geffre, R., high-fidelity s.w. receiver TR138, **3243**
van Gemert, A. G. M., H. den Hartog and F. A. Muller, self-quenching G-M counters, **1139**
George, W. D., M. C. Selby and R. Scolnik, measurement of characteristics of quartz crystal units, **137**
Gerard, V. B., sporadic-E ionization, **3135**
Gerardin, L., double-T RC network, **2746**
Gerber, W., and A. Werthmüller, short-range fading of broadcasting transmissions, **2036**
Gerdien, H. F., air-flow resistance of porous ceramics, **3018**
Gerks, I. H., analysis of distortion from two-path propagation, **(A)1757**
Gershtein, G. M., secondary emission in split-anode magnetrons, **2973**
—— with V. E. Kalinin, dynatron effect in multi-segment magnetrons, **2871**
Gerson, N. C., and S. L. Seaton, generalized magneto-ionic theory, **1464**
Gerst, I., with D. Herr, analysis and synthesis of linear servomechanisms, **355**
Gervais, R. B., Rural Radio Network f.m. system, **523**
Geyger, W., measurement of small d.c. voltages, **3477**; single-stage feed-back a.c. amplifier, **2495**
Ghalib, S. A., electronic control of machine tools, **(A)3507**
Giacoletto, L. J., and S. Stiber, m.f. crossed-loop d.f. set, **3431**
Giacomini, A., ultrasonic modulation of light beams, **1256**
Giāo, A., gravitation and electromagnetism, **3128**
Gibas, H., far-near device for radio receivers, **2614**
Gibson, E. A. S., European receiving valves, **1234**
Gibbings, D. L. H., with G. Newstead, transients in low-pass filters, **3081**
Gielessen, J., with H. Ebert, pressure and temperature coefficients of resistance of certain alloys, **3173**
de Gier, J., c.r. tube for projection television receiver, **1836**
—— with others, home projection television, **3275**
Gieringer, C. K., frequency stabilization of diathermy units, **1142**
Gill, E. W. B., measuring ground conductivity and dielectric constant, **2281**
—— and A. von Engel, starting potentials of electrodeless discharges, **2500**
Gillon, G., step-by-step integration applied to LRC circuits, **2665**
Gilloux, F., very-high-quality amplifier, **1003**
Gilloux, H., amplifiers for square-wave signals, **1340**; transformer design for c.r. amplifier output, **1008**
Gillson, J. L., aerial array radiation patterns, **1601**

Giniaux, G., reception of London television transmissions in Calais, 547
Ginther, R. J., with others, CaSiO$_3$-Pb and CaSiO$_3$-(Pb + Mn) phosphors, 735
Ginzton, E. L., with others, microwave impedance bridge, 2566
Giovanelli, R. G., chromospheric flares, 376; magnetic and electrical phenomena associated with sunspots, 78
Gipps, D. I., with others, F_2-layer abnormalities near Brisbane, 1662
Gipps, G. de V., D. I. Gipps and H. R. Venton, F_2-layer abnormalities near Brisbane, 1662
Giroud, P., and J. Couillard, Decca navigator, 1401
Gisolf, J. H., temperature dependence of resistance of semiconductors, 3169
Gladwin, A. S., distortion of f.m. waves by transmission networks, (D)324; oscillation amplitude in simple valve oscillators, 2176; pulse splitting, 2910
Glaser, J. L., with others, interactions between microphones, couplers and earphones, 2129
Glaser, R. A., phase measurement, 434
Glaser, W., theory of deflection of electron beams, 2787
Glasoe, G. N., and J. V. Lebacqz, Pulse Generators, (B)917
Glasser, O. J., and J. D. Kraus, impedance of helical aerials, 650
Glazier, E. V. D., network transients, (D)350; radio-link design for automatic telegraph networks, 211
Glucksman, H. A., superregeneration, analysis of linear mode, 2309
Gneme, G., European broadcasting conference, Copenhagen, 3254; maritime regional radiocommunication conference, Copenhagen, 3255; 3rd session of I.T.U. council, 3250
Godfrey, R. M., with C. W. Earp, d.f. by cyclical differential measurement of phase, 1059, 2233
Goedhart, D., with others, 48-channel carrier telephone system, 3251
Goethals, R., resistance-type extensometers, 173
Gohlke, W., wide-range piezoelectric pressure gauge, 2868
Golay, M. J. E., efficiency of information reception with pulse-position modulation, 3550
Gold, T., physical basis of action of cochlea, 1260; rotation and terrestrial magnetism, 2219
—— and R. J. Pumphrey, cochlea as frequency analyser, 1259
Goldberg, E. A., electronic simultaneous equation solver, 420
—— and G. W. Brown, electronic simultaneous equation solver, 760
Goldberg, H., noise factors for receivers, 505, (C)1776
—— and C. C. Bath, multiplex system using p.t.m. and p.f.m., 1790
—— and E. L. Crosby, Jr, series-mode quartz-crystal oscillator circuit, 333
—— with C. C. Bath, thermistor bridge for r.f. power measurement, 441
Gol'dfarb, L. S., stability of electronic voltage regulator, 2333
Goldman, S., Frequency Analysis, Modulation and Noise, (B)2007; theory of noise reduction and range in radar and communication, (A)509
—— and others, electronic mapping of activity of heart or brain, 1741
Goldmuntz, L. A., and H. L. Krauss, cathode-coupled clipper circuits, 193
Goldsmith, A. N., and others, Frequency Modulation, Vol. 1, (B)529; Radio at Ultra-High Frequencies, Vol. 2, (B)923
Goldsmith, K., transformer impedance measurement by bridge methods, 2263
Goldsmith, T. T., Jr, u.h.f. television, (A)1810
—— and H. Milholland, television transcription by cinema film, 235, 543
—— R. P. Wakeman and J. D. O'Neill, television propagation survey for New York metropolitan area, 2353
Goldstein, H., counter-tube amplifier, 1906
Goldstein, M. K., control of resonance effects on aircraft h.f. d.f. bearings, (A)1672; long-range navigation systems, (A)1672
Goldwater, D. L., with W. E. Danforth, resistance of BaO and SrO cathode coatings for high pulse emission, 2093
Golovin, G. I., Russian scientists' part in television development, 1207
Gomm, W. H., with others, technique of radio valve manufacture, 2065, (A)2947
Goodale, E. D., and R. C. Kennedy, phase and amplitude equalizer for television, 1893
Goodall, W. M., television by p.c.m., (A)1785
Gooden, J. S., maximum field strength round aerial in waveguide, 646
Goodhue, W. M., higher-mode techniques for waveguides, (A)299
Goody, R. M., temperature at tropopause and of lower stratosphere, 311
Gordon, A. N., random-walk problem, (D)685
Gordon, G. H., television video recording technics, 2655
Gordon, R. R., H. Powell and R. A. C. Isbell, industrial infra-red spectrometer, 3494
Gordon, W. E., radar reflections from lower atmosphere, 1761
—— with E. W. Hamlin, phase difference for 3.2-cm waves over 27-mile path, 493
—— with others, method of determining angle of arrival, 1481; vertical angle of arrival of u.h.f. waves, 2299
Gordy, W., microwave spectroscopy, 3125
Gorelik, G. S., interference, diffraction and resolution in optics and radio, 1914
Gorio, T., 1948 C.C.I.R. meeting, Stockholm, 3253
Gorter, C. J., L. J. F. Broer and A. P. Snoek, photoelectric voltages with intermittent light, 1916
—— with A. P. Snoek, photoelectric voltages with intermittent light, 1915
Gotlieb, C. C., P. E. Pashler and M. Rubinoff, radio investigations of shell flight, 186
Gotschall, G. D., light modulation by P-type crystals, 65
Götz, J., sound transmission through metal plates at oblique incidence, 2998
Goubau, G., and J. Zenneck, FIAT Review of German Science 1939–1946: Electronics, incl. Fundamental Emission Phenomena: Part 1, (B)2414
—— with others, microwave filter theory and design, 3374
Goudet, G., u.s.w. propagation, 821
Gouriet, G. G., distortion of scanning waveforms, 3271; television interference patterns, 3574
—— with H. Page, ignition interference with f.m. transmissions at 45 and 90 Mc/s, 508
Govyadinov, V. A., acoustics of broadcasting receivers, 1267
Goward, F. K., azimuthal inhomogeneities in field of betatron or synchrotron, 178
—— with C. H. Westcott, matching of wide-band aerials and feeders at 500–600 Mc/s, 1596
Grace, F. C., television monitor receiver, 3488
Gracely, F. R., ground-wave broadcast signal variations, 2306
Graffunder, W., electron accelerators, 2878
Grammer, G., additive frequency meter, 2273
Grandmontagne, R., and C. Delestrade, colour variations of night sky, March 1947–May 1948, 1387
Granlund, J., with L. B. Arguimbau, f.m. transatlantic communication, 518, 1558
Grant, E. F., response of frequency discriminators to pulses, 2311; sensing method of a.f.c. for microwave oscillators, 3096
Grantham, R. E., and J. J. Freeman, microwave attenuation standard, (A)1730, 2578
Gratian, J. W., noise in magnetic recording systems, 2710
Grattidge, W., and F. A. Vick, Manchester conference on semiconductors, 1097
Graybeal, T. D., frequency response characteristics of recording instruments, 2561
Green, P. E., Jr, automatic plotting of e.s. fields, 1125
Greene, H. C., NWDR German broadcasting stations, 593
Greenlee, L. E., laboratory pulse counter, 2285
Greenwood, I. A., Jr, J. V. Holdam, Jr, and D. MacRae, Jr, Electronic Instruments, (B)454
Greenwood-Wilson, A., design for an electronic brain, (D)1739
Gregoretti, G., dynamic methods for valve characteristics, 256; h.f. dielectric heating, 2876
—— with C. Egidi, reception of WWV standard-frequency signals at Turin, 136
Greig, H. G., high-speed electrolytic facsimile recording, 536
Greig, J. H., with A. B. Cullen, Jr, resonant-cavity linear accelerator, 811
de Greve, L., with A. van Itterbeek, resistance, of superposed metallic films, 1960, of thin films of Cu, Ag and Pb, 1959, of thin Ni films, 1961
Grieg, D. D., with A. M. Levine, terminal equipment for pulse-time multiplex, (A)2628
—— with S. Metzger, pulse-count modulation, 519
—— with S. Moskowitz, noise-suppression characteristics of p.t.m., 2314
—— with others, distortion in pulse-count modulation, 768
Griemsmann, J. W. E., with H. J. Carlin, coaxial attenuator for 4–10 kMc/s, 348
Griese, H. J., application of f.m. in s.w. radio technique, 2634; moving-coil microphone, 1268; technique of dense standard-frequency spectra, 2570
Griffin, D. A., narrow-band pulse transmission, 2909
Griffin, J. P., and E. S. Pennell, EDT crystals, 2529
Griffing, B. L., German valve developments, 557
Griffing, V., and F. E. Fox, ultrasonic intensity gain due to concave reflectors, 3004
—— with F. E. Fox, ultrasonic intensity gain due to concave reflectors, 3005
Griffith, R. M., and W. Rosinski, naval v.h.f. d.f., 1060
Griffiths, H. V., and R. W. Bayliff, electronic switch for diversity reception, 1878
Griffiths, J. H. E., magnetic phenomena in ferromagnetic materials at cm λ, (A)364
Grignon, L. D., stereophonic sound for the cinema, 1848
Grimwood, W. K., volume compressors for sound recording on film, 1270
Grinstead, L., and H. P. Zade, r.f. welding of plastics, 3451
Griswold, W. R., with E. J. Isbister, American views on marine radar, (A)2803
Grivet, P., television and its industrial outlook to-day, (A)874; units, (D)683
—— with J. Soutif-Guicherd, measurement of magnetic permeability at u.h.f., 2841
Groenewold, H. J., ionosphere and s.w. propagation, 88
Grondahl, L. O., Cu/Cu$_2$O rectifiers, 2645
de Groot, W., origin of Giorgi system of units, 356
Gross, F. J., course-line computer for radio navigation, 3148
Gross, K. A., with R. I. Garrod, vacuum gauge for 10^{-4} to 10^{-5} mm Hg, 730
Gross, P. M., Jr, with R. H. Cole, wide-range capacitance conductance bridge, 2846
Gross, W., with P. G. Bordoni, sound radiation from finite cylinder, 2885
Grosskopf, J., frequency division, 53; ground conductivity measurements in Schleswig-Holstein, 2832; rhombic aerials with feedback, 2714
Grosskurth, K., present knowledge and technical applications of infra-red radiation, 1134
Grübel, G., phase-meter for laboratories, 2856
Grün, A., planning of dm-λ links, 2049
de Gruyter, E., resonance phenomena in oscillatory circuits, 3376
Guanella, G., Swiss developments in u.s.w. multichannel communications, 3544
te Gude, H., electron scanner, 3227
Guénard, P., R. Berterottière and O. Doehler, amplification in double-beam valve, 2977
—— R. Warnecke and C. Fauve, efficiency of v.m. valves, 1558
—— with R. Warnecke, television and recent developments in u.h.f. valves, (A)904, 1545
Guertler, R., impedance transformation in folded dipoles, 3342
Guéry, F., law of action between moving charges, 2783
Guigonis, —, aerial radio navigation in wartime, 1400
Guillemin, E. A., linear network theory, (A)1612; synthesis of RC networks, 2462
Guimarães, M. A., and P. A. Sampaio, G-M counter operation, 3497
Gund, K., and H. Reich, beam extraction for centrifugal electron-accelerators, 3222
Gundlach, F. W., space-charge control in transit-time region, 998; transit-time valves, 2175
Gunn, M. E., equipment for KOMO broadcasting studios, 1188; WMGM master control equipment design, 2050
Gunn, R., e. s. field inside clouds, 1388
Gurewitsch, A. M., with others, 70-MeV synchrotron, 2594
Guterman, P., Rural Radio Network f.m. advertising, 595
Gutkin, L. S., impulse interference in superregenerative receivers, 2618
Gutmann, F., electrets, 2458
Gutton, H., and J. Ortusi, wide-band modulation with magnetron, (A)894
Gvozdover, S. D., and V. A. Zore, dm-λ triode feedback oscillator, 999

H

Haantjes, J., and F. Kerkhof, projection-television receiver, deflection circuits in, 2934, 3275, synchronization, 3275, 3569
Häård, B., signal/noise ratios in p.m. systems, 502
Haase, A. P., with C. R. Knight, low-noise a.f.-input valve, 3303
Hacke, J. E., Jr, and J. M. Kelso, approximate solution of ionosphere reflection problems, 1050
Hackley, C. L., with C. W. Clapp, low-distortion a.f. oscillator, (A)1612
Haddock, F. T., with others, solar noise at 9500 Mc/s and coincident flare, 697
Hadfield, B. M., increase of valve power output, 2393
Hadfield, D., with D. A. Oliver, magnetic materials, 1417
Haeff, A. V., electron-wave valve, 1825, (D)3300; origin of solar radio noise, (A)1652, 3412; space-charge wave amplification effects, 1024
—— H. D. Arnett and W. Stein, solution of 2-beam electron-wave-valve equation, (A)1824
Haegele, R. W., crystal-tetrode mixer, 3597, 3598
Hagen, G. E., and D. H. Loughridge, testing efficiency of G-M counters, 461
Hagen, J. P., with others, solar noise at 9500 Mc/s and coincident flare, 697
Hagenguth, J. H., photographic study of lightning, 722
Haggis, G. H., with J. F. Tait, demountable G-M counter using helium/ether mixture, 3496
Hahn, T. F., J. Ebert and W. A. Lynch, broad-band signal generator, 2576
Hahn, W. C., effect of hydrostatic pressure on electron flow in diodes, 566
—— with E. J. Lawton, standing-wave type linear accelerators for electrons, 1452
Hailes, W. D., railroad radio, 1509
Hales, W. B., thermistors for thermometry and anemometry, 3355
Haley, A. C. D., with A. Levin, design of marine radar equipment, 3146
Hall, A. C., with others, electromechanical strain-gauge multiplier, (A)1612
Hall, J. S., Radar Aids to Navigation, (B)1083
Hall, L. L., with A. Cook, Criggon radio station, 852
Hallén, E., aerial impedances, 1597; properties of long aerial, 1589; tables of iterated sine and cosine integrals, 1702; units in Giorgi and c.g.s. systems, 1640
Hallenbeck, F. J., with others, filters and phase-simulating network for carrier system, 2752
Haller, C. E., with others, 100-W 1000-Mc/s grounded-grid triode, 569
Hallman, L. B., Jr, Dimeal approach and landing system, (A)1672; universal beacon system, 1080
Hallows, R. W., radar for Liverpool channel, 729; televising moving images, 3272; Vidor Kalium dry battery, 230
Halsey, R. J., and J. Swaffield, R/T and the vocoder, 513
Hamaker, H. C., current distribution in triodes, 2388
Hamburger, F., Jr, and E. J. King, recording photometer for c.r. tube displays, 1198
Hamburger, G. L., automatic a.f. response curve tracer, 148; graphical analysis of diode circuits, 2152
Hames, F. A., and D. S. Eppelsheimer, ferromagnetic Cu-Mn-Ga alloys, 1408
Hamilton, G. E., television transmitter design, 138
Hamilton, W. H., response of tuned amplifier to gliding tone, 2473
Hamlin, E. W., and W. E. Gordon, phase difference for 3.2-cm waves over 27-mile path, 493
—— and A. W. Straiton, phase difference for two vertically spaced aerials, 1057
—— P. A. Seay and W. E. Gordon, vertical angle of arrival of u.h.f. waves, 2299
Hanley, T. E., emissivity of thoria cathodes, 1546
Hannay, N. B., D. MacNair and A. H. White, semiconducting properties of (Ba, Sr)O, 3444
Hansen, H. N., crystal oscillator for carrier supply, 2756
Hansen, J. A., television receiver channel-switching mechanism, 2066
Hansen, W. W., surveying with pulsed light, 2601; theory of disk-loaded waveguides, 1286
—— and R. F. Post, measurement of cavity impedance, 1719
—— with E. L. Chu, disk-loaded waveguides, 2139
—— with D. E. Wiegand, 60-c/s hysteresis loop tracer, 772
Hansford, R. F., marine radar, development of 1942, the present outlook, 2803
Harbury, P., tropospheric measurements by radar, 3520
Harder, E. L., voltage regulation, 859
—— and G. D. McCann, Westinghouse and California Institute of Technology computers, 2546
Hardie, A. M., transient response of oscillatory circuit with recurrent discharge, 3098
Hardy, A. C., and E. C. Dench, electronic method of solving nonlinear simultaneous equations, 1705
Harman, W. W., tunable waveguide cavity resonator, 2476
Harnischmacher, E., u.h.f. measurements at Freiburg, 2896
Harries, J. H. Owen, secondary-electron suppression, 558
Harrington, J. V., and T. F. Rogers, improvement of signal/noise ratio by integration in storage tube, (A)1769
Harris, D. B., forward-transmission echo-ranging system, (A)1672, 3140
Harris, E. J., application of a.c. amplifiers to optical measurements, 1007
—— and P. O. Bishop, design and limitations of d.c. amplifiers, 3384; l.f. noise from amplifying valves, 574
Harris, G. R., RC bridge networks, 3073
Harris, H., comparison of two basic servomechanism types, 854
Harris, I. A., calculation of valve electrode temperatures, 1232, (D)3302; circuit requirements and valve design, 2378
Harris, W. A., valve noise theory and input-circuit design, 584
Harrison, A., with others, fitting and use of marine radar, 2803
Harrison, A. E., and N. W. Mather, graphical analysis of tuned coupled circuits, 3377
Harrison, D. N., radio d.f. methods of measuring wind velocity, 1070
Harrod, K. W. G., accuracy of sky-wave delay measurements, 190
Hart, E. D., Q-meter controversy, (D)2839
Hartmann, J., and T. Mortensen, methods of measuring sound-wave energy, 617
den Hartog, H., and F. A. Muller, noise reduction in thermionic electrometers, 1997
—— with others, self-quenching G-M counters, 1139
Hartree, D. R., historical survey of digital computing machines, 1425
Hartshorn, L., experimental basis of electromagnetism, 3123; r.f. heating, 1738
—— and L. Essen, radio standards, (A)452, 1715
—— with N. R. Campbell, experimental basis of electromagnetism, 3123
Harvard University, Computation Laboratory, Tables of the Bessel Functions of the First Kind, (B)1708; Tables of Generalized Sine and Cosine Integral Functions, (B)3462
Harvey, F. W., and E. D. Hilburn, WMAL-TV mobile television unit, 2064
Harvie, R. B. R. S., anisotropic dielectric-loaded waveguide for linear accelerators, 1744; travelling-wave linear accelerators, 176
—— with others, travelling-wave linear accelerator for 4-MeV electrons, 1148
Hatch, J. F., h.f. d.f. with Adcock aerials, 1077
Hatcher, R. W., and J. S. Sawyer, sea-breeze structure, 1668
Hathaway, J. L., and W. Hotine, portable crystal-controlled transmitter, 550
—— with others, bearing deviation indication for sonar, 725
Haubert, A., ionospheric absorption and field-strength calculations, 2301
Haugen, G. L., with others, train television, 1814
Hausz, W., with L. J. Neelands, telemetry for guided missiles, 425
Hawkins, D. B. G., improved Schmidt plate, 2650
Hawkins, P. O., and C. C. Costain, a.m. of cm waves by electron beam, 3382
Hawley, M. E., with F. H. Slaymaker, acoustic impedance matching by means of screens, 610
Hawley, M. S., microphone open-circuit voltage measurement, 2130
Hay, D. R., with others, horn-aerial radiation patterns, 1599
Haynes, J. R., and W. Shockley, hole injection in transistor action, 2109
Hazeltine, A., D. Richman and B. D. Loughlin, superregenerator design, 490
Heath, W. L., hum reduction in valves, (D)1241
Hebb, M. H., C. W. Horton and F. B. Jones, design of networks for constant delay, 3368
Hebenstreit, W. B., double-stream amplifiers, (A)1612
—— with J. R. Pierce, theory of v.h.f. amplifier with double-stream electron flow, 2486
Hector, L. G., and H. R. Jacobus, smallest commercial pentodes Types 5811 and 5807, (A)1612
—— and H. W. Koren, ceramic gramophone pickup, 935
Hedeman, W. R., Jr, crystal-saving circuits for v.h.f. receivers, 497
Hedstroem, S.-E., and L. F. Borg, transductor fundamentals, 313
Heegaard, F., and E. Cohrt, Copenhagen Broadcasting House, 222
Hees, G., with others, emission constant and apparent work function for oxide cathodes, 562
Heffels, J., measurement of resistor loss-angle, 1122
Hegbar, H. R., electronic analogue computer, 1704
—— with P. T. Smith, double-tetrode u.h.f. power valves, 906
Heightman, D. W., tropospheric propagation on lower radio frequencies, [illegible]
Heilmann, A., 25 years of broadcasting in Germany, 2639
Heins, A. E., radiation and transmission properties of semi-infinite parallel plates, 1920, 2144
Hekner, J., with E. E. Zepler, triode interelectrode capacitances, 2101
Helber, C. A., voltage regulator for 250-VA 400-c/s inverter, 860
Helliwell, R. A., ionospheric virtual height measurements at 100 kc/s, 3132
Hélot, J., rototrol control system, 2918
Henderson, W., klystrons for f.m., 2403
van Hengel, J., and W. J. Oosterkamp, direct-reading dynamic electrometer, 2845
Henisch, H. K., Metal Rectifiers, (B)3269; thermoelectric and conductive properties of TiO$_2$, 116
Hennelly, E. F., with W. C. Dunlap, Jr, non-rectifying Ge, 742
Henrich, L. R., with others, e.m. deflector for beam of 184-inch cyclotron, 472
Henry, R. L., with G. Shapiro, subminiature i.f. amplifiers, (A)1612
Hepp, G., automatic change-over to emergency apparatus, 2323
Herlin, M. A., and S. C. Brown, u.h.f. breakdown of air between coaxial cylinders, 690
Herman, H., measurement of microwave power, (A)1713
Herold, E. W., testing for residual gas in valves and vacuum systems, (A)1681
—— and C. W. Mueller, beam-deflection mixer valves for u.h.f., 2363
Herold, J., WOW-TV television field car, 2348
Herr, D., and L. Gerst, analysis and synthesis of linear servomechanisms, 855
Herreng, P., test sets for carrier-current systems, 1127
—— with G. Couanault, impedance irregularities of coaxial cables, 148
Herrick, G. Q., interference suppression for the 'Voice of America', 3538
Herrick, R. H., Great Lakes R/T system, 1792
Herring, C., and M. H. Nichols, thermionic emission, 3407
Herrmann, G., and O. Krieg, effect of gases and vapours on emission of oxide cathodes, 2965
—— and S. Wagener, Die Oxydkathode, (B)2985
Herrnkind, O. P., Tungsram miniature battery valves, 1227
Hershberger, W. D., minimum detectable microwave absorption, 693
—— with others, determination of aircraft ground speed using pulse-Doppler radar, (A)1672
Hertwig, H., sawtooth oscillations, 51
Hertzberg, R., Philadelphia/Pittsburgh/Cleveland television coaxial cable, 1581
Herwald, S. W., with G. D. McCann, dimensional analysis of servomechanisms, 853
Herzog, R., with F. Ehrenhaft, effect of magnetic field on radiation from Ra-E, 694
Herzog, W., insertion and echo loss for no-load quadripole, 964; methods for varying the resonance frequency of crystal oscillators, 861, 1895; nonsymmetrical matched filters, 68; relation between oscillators and filters, 3375
Hess, H. A., h.f. echoes, 3583; s.w. propagation over polar regions, 2606
Hessel, J., future military radio communication, 831
—— G. Goubau and L. R. Battersby, microwave filter theory and design, 3374
Hessler, V. P., and J. J. Carey, Fundamentals of Electrical Engineering, (B)922
Hettner, G., generation of 0.1-mm waves, 2175
Hewitt, F. J., J. Hewitt and T. L. Wadley, frequency prediction for Southern Africa, (D)487
Hewitt, J., with others, frequency prediction for Southern Africa, (D)487
Hey, J. S., galactic and solar noise, (A)372

—— S. J. Parsons and J. W. Phillips, solar radiation, 1368
Heymann, F. G., with A. L. Chilcot, potassium-activated cold-cathode valves, 3598
Heymann, O., general theory of modulation and demodulation, 2482; theory of vibration testing, 3463
Higgins, C. S., with others, moon echoes and penetration of ionosphere, 2030
Higgins, T. J., history of operational calculus, 1313
—— with R. M. Soria, approximate calculations for waveguides, 293
Hilburn, E. D., with F. W. Harvey, WMAL-TV mobile television unit, 2064
Hilliard, J. K., miniature omnidirectional microphone, 1853; theatre-loudspeaker design and performance, 3026
Hillier, J., and S. G. Ellis, illumination system of electron microscope, 3511
—— with E. G. Ramberg, chromatic aberration and resolving power in electron microscopy, 1453
Hills, E. G., multipath television effects, 3527
Hinckley, G. L., radio telemetry, 3184
Hines, H. M., with others, exposure of animals to microwaves, 2284
Hines, J. N., and C. H. Boehnker, measuring phase of radiation from aerials, 2571
Hintzbergen, L., measurement of phase angles with c.r.o., 2852
Hirsch, C. J., parametric electronic computer, (A)1703
Hoberman, M., with A. M. Levine, 50-Mc/s wide-band oscilloscope, (A)1713
Hobson, P. T., design for an electronic brain, (D)1739
Hodelin, J. A., coaxial cables with high characteristic impedance, 1278
Hodgson, R., theatre television system, 2653
Hoffmeister, C., atmospheric currents at 120 km height, 1932
Hofstadter, R., crystal counters, 2506, 2507
van Horweegen, J. M., and K. S. Knol, universal adjustable u.h.f. transformer, 381
Hogarth, C. A., variation of semiconductor properties with vapour pressure, 115
Hok, G., multifrequency bunching in reflex klystrons, (D)1244; response of linear resonant systems, 671, (C)1325
Holdam, J. V., Jr, with others, Electronic Instruments, (B)454
Holdaway, V. L., quadrature operation of thermionic valves, 1228
Holland, R. D., with D. Quinn, homing beacons for naval aircraft, 99
Hollenberg, A. V., design and construction of v.h.f. amplifier with double-stream electron flow, (A)1612, 2487, 3388
—— N. Kroll and S. Millman, rising-sun magnetrons, 1553
Hollis, J. L., automatic stabilization of f.m. oscillator, 26
Hollis, W. C., power amplifier for Citizens' transmitter, 1606
Hollway, D. L., ionization manometer tube, 1948; reflex klystron manufacture in Australia, 580
Holmes, L. C., quality of magnetic recording systems, (A)2423
Holmes, M. F., with G. H. Metson, poisoning in high-vacuum oxide-cathode valves, 2092
Holmes, T., fixed high-stability carbon resistors, 27
de Holzer, R. C., calculation of mutual inductance for multilayer coils, 319
Homès, G. A., ultrasonic opacity of porous media, 2696
Honerjäger, R., diffraction of e.m. waves at wire grid, 1754
Honnor, W. W., with others, experimental f.m. broadcast transmitter, 1230, 2939
Honour, A. J., with B. D. Corbett, timer for radioactivity measurement, 3210
Hoogenstraaten, W., with F.A. Kröger, decay and quenching of fluorescence in willemite, 3156
—— with others, influence of temperature quenching on fluorescence decay, 3157
Hooker, O. N., with H. de B. Knight, hot-cathode hydrogen-filled thyratron, 2392
Hopkins, H. F., and C. R. Keith, theatre loudspeaker system, 631
Hopkins, H. G., and F. Horner, v.h.f. d.f. site errors, 3145
Hopper, A. L., and S. E. Miller, design of radar i.f. amplifier, (C)3389
Hormuth, W., interference-free reception using aerials with screened down-leads, 2624
Horner, F., scattering of radio waves by metal wires and sheets, 3237; spaced-loop aerials, 310
—— with H. G. Hopkins, v.h.f. d.f. site errors, 3145
Hornung, J. L., Radar Primer, (B)2239
Horstman, E. C., and J. M. Valentine, WENR-TV station, Chicago, 2935
Horton, C. W., diffraction of plane wave by semi-infinite conducting sheet, 3229; theory of radiation patterns of e.m. horns, 3063
—— with R. B. Watson, radiation pattern of dielectric rods, 1297, 1603
—— with others, design of networks for constant delay, 3368
Hoselitz, K., and M. McCaig, anisotropic permanent-magnet alloys, Alcomax, 1958, 3453
Hotine, L., broadcasting arrangements for Olympic Games, 522
Hoene, W., with J. L. Hathaway, portable crystal-controlled transmitter, 659
Houldin, J. E., with A. J. Biggs, *Q*-meter methods of impedance measurement, 3192
Houlding, N., valve noise and transit time, (D)583
Houstoun, R. A., efficiency of barrier-layer photocells, 900
Houtgast, J., and M. Laffineur, dm-λ solar radiation perturbations, 698
Howatt, G. N., J. W. Crownover and A. Dranetz, piezoelectric $BaTiO_3$, 1087
—— with others, $BaTiO_3$ ceramics, 2583
Howe, H. H., selected days, preliminary mean *K*-indices and preliminary *C*-numbers for Oct.–Dec. 1948, 3418
Hoyle, F., and D. R. Bates, origin of E layer, 388
Hubbard, E. L., with others, pulsed oscillator for f.m. cyclotron, 2017
Hubbard, P. G., compensated hot-wire anemometer, 2586
Huber, E., with W. Steinmann, Zürich/Geneva multichannel R/T link, [illegible]
Huber, H., electron-gun design, 1550
—— and W. Kleen, electron beams of high current-density in e.s. fields, [illegible]
Huber, P., with others, high-speed coincidence circuit for multipliers, 167
Huber, W., food preservation with capacitron, 478
Hubert, P., electron lens corrected for spherical aberration, 1457; magnetic lens with curvilinear axis, 1458
Hugenholtz, E. H., with H. B. R. Boosman, frequency control in transmitters, 2070
Huggins, W. H., multifrequency bunching in reflex klystrons, (C)283; network approximation in time domain, (A)1612
Hughes, A. L., with others, ethylene-filled G-M counters, 164
Hughes, D. H., v.h.f. communication equipment for vehicles, 1797
Hughes, D. J., fundamental nuclear particles, (A)1639
Hughes, V., with others, Waveforms, (B)2306
Hughes, V. A., with others, daylight meteor streams, May–Aug. 1947, 76
Hughes, W. A., and M. M. Astrahan, duo-mode waveguide exciter, 3338
—— with others, multiplex transmission through waveguides, 300
Hugon, J., use of reflector and e.m. lenses for France/Corsica R/T link, 2147
Hull, J. F., and A. W. Randals, high-power interdigital magnetrons, 908
Hulsizer, R. I., with others, Electronic Time Measurements, (B)3491
Hume-Rothery, W., with others, structure and properties of alloy Cu_2MnIn, 1956
Humphreys, B. L., and E. G. James, interelectrode capacitance of valves, 2102, 2985
—— with E. G. James, effect of resistive films on interelectrode capacitance of valves, 2385
Humphreys, R. F., W. W. Watson and D. L. Woernley, ultrasonic modulation of light beam, 2628
Hunt, V. A. M., radio aids to civil aviation, 401
Hunter, A., solar physics, 1373; suppression of interference in ships, 2316
Hunter, J. L., with F. E. Fox, ultrasonic interferometer with resonant liquid column, 930
Hunter, W. C., with others, 6-channel mobile system, (A)1785
Huot de Longchamp, M., with I. Franke, production of large quartz crystals, 1964
Hurd, D. T., mechanism of breakdown of gases, liquids and solids, 1023
Husain, S. A., with others, h.v. measurement by oscillating electrode systems, 780
Husten, B. F., and H. Lyons, microwave frequency standards, (A)1712, 2652
Hüter, T., propagation of ultrasonic waves in solid rods, 1567
Hutter, R. G. E., electron-beam deflection, 2677

Huxford, W. S., with J. M. Frank, properties of infra-red Cs arc, 512
Huxley, L. G. H., H. G. Foster and C. C. Newton, interaction of radio waves in the ionosphere, 194

I

Iams, H., with H. B. DeVore, microwave optics between parallel conducting sheets, 1292
Ifland, H., use of Cu_2O rectifiers for measuring small a.c. voltages, 3187
Ijdens, R. A., ceramics and their manufacture, 2251
Infeld, L., theory of waveguides, 3335
—— A. F. Stevenson and J. L. Synge, theory of waveguides, 3335
Ingård, U., radiation of sound into circular tube, 1, 608
—— with others, acoustic reactance of small circular orifices, 2701
Ingerslev, F., and K. Nielsen, work of Technical Acoustics Laboratory, Copenhagen, 2324
Ingersoll, J. G., with others, microwave absorption spectrum of oxygen, 3410
Ioffe, A. V., rectification at boundary between semiconductors, 1412
van Iperen, B. B., e.m. oscillations in spiral due to axial electron current, 3596
Isbell, R. A. C., with others, industrial infra-red spectrometer, 3494
Isbister, E. J., and W. R. Griswold, American views on marine radar, (A)2803
Isenberg, L., with others, electromechanical strain-gauge multiplier, (A)1612
Ising, G., sphere and toroid coil-galvanometers, 2843
Iskenderian, H. P., with L. Brillouin, thermomagnetic generator, 1309
Israël, H., and G. Lahmeyer, atmospheric potential gradient, 1055
Istvánffy, E., dipole impedance measurement by reflection method, 2559; radar problems, 104
van Itterbeek, A., and L. de Greve, resistance, of superposed metallic films, 1960, of thin films of Cu, Ag and Pb, 1959, of thin Ni films, 1961
Ives, D. J. G., and R. W. Pittman, amplifier for use with conductance bridges, 1907

J

Jackson, W., and J. A. Saxton, microwave absorption effects in liquids and solids, (A)366, 2244
Jacob, L., electron optics of immersion systems, 814; emission microscope for oxide cathodes, 3486
—— with P. A. Einstein, electron-optical immersion objective, 183
—— with T. Mulvey, distortion-free e. s. lenses, 2292
Jacobi, T. E., multichannel h.f. radiotelegraphy, 1500
Jacobi, W. J., sound propagation within cylinders of liquid, 2688
Jacobs, H., and A. P. LaRocque, effect of Ba compounds on cold-cathode behaviour, (A)1824
—— and B. Wolk, analysis of gas in cathode-coating assemblies, (A)1824
—— G. Hees and W. P. Crossley, emission constant and apparent work function for oxide cathodes, 562
Jacobus, H. R., with L. G. Hector, smallest commercial pentodes Types 5811 and 5807, (A)1612
Jacottet, P., measurement of dielectric properties at u.h.f., 1119; spiral eddy-current fields, 3334; transverse field in circular waveguides, 3335
Jaeger, J. C., high-pass filter function, 968; An Introduction to the Laplace Transformation, (B)3182
Jaffe, A. A., with others, discharge spread in G-M counters, 163
Jahnke, —, and — Emde, Tafeln höherer Funktionen, (B)2826
James, E. G., and B. L. Humphreys, effect of resistive films on interelectrode capacitance of valves, 2385
—— with B. L. Humphreys, interelectrode capacitance of valves, 2102, [illegible]
—— with others, u.s.w. triode oscillators, (D)338
James, E. J., negative-feedback design formulae, 56; tone-control circuit, 1272
James, H. M., N. B. Nichols and R. S. Phillips, Theory of Servomechanisms, (B)232
Janes, R. B., R. E. Johnson and R. S. Moore, television camera tubes, (A)1810, 2924
Janovsky, W., and R. Pohlman, generation of ultrasonic waves in liquids for industrial purposes, 1442
Jarkowski, H., with others, over-sea propagation for λ 3 cm and λ 9 cm, 2934
Jarvis, A. R., and others, quartz-crystal chronometer, 1112
Jasnak, W., with W. A. Prowse, c. r. o. observations on u.h.f. sparks, 1643
Jeffers, C. L., aerial for controlling non-fading range of broadcasting stations, 647
Jeffery, C. N., design charts for air-cored transformers, 2725
Jeffreys, H., origin of solar system, 1030
Jelatis, J. G., dielectric constant and dipole moment of gases, 764
Jelonek, Z., and E. Fitch, pulse communication, (D)1184
—— with others, carrier frequency-shift telegraphy, (D)1180
Jen, C. K., measurement of dielectric constant of gases by means of resonant cavity, 1434
Jenkins, I., research on non-ferrous materials at General Electric laboratories, 2993
Jenkins, R. O., field emission of electrons, 1356
—— and R. H. C. Newton, free Ba and the oxide cathode, 2957
Johanson, A. E., timing control for p.c.m., 1788
Johns, J. P., with C. F. Booth, mass production of quartz crystals, 111
Johnson, D. C., with E. G. Fubini, signal/noise ratio in a.m. receivers, (A)501, 1176
Johnson, E. A., T. Murphy and P. F. Michelsen, high-sensitivity remanent magnetometer, 3469
—— T. Murphy and O. W. Torreson, pre-history of earth's magnetic field, 1045
Johnson, J. S., and F. E. Williams, mechanism of luminescence in phosphors, (D)2807
Johnson, K. C., single-valve f.m. oscillators, 1898
Johnson, M. H., and G. T. Rado, ferromagnetism at v.h.f., 1994
Johnson, M. P., temperature control in communication engineering, 861
Johnson, R. E., with others, television camera tubes, (A)1810, 2924
Johnson, S. A., microwave slotted sections, 2567
Johnson, S. W., spurious printing in magnetic tapes, 3030
—— with G. L. Dimmick, optimum high-frequency bias in magnetic recording, 635, 3031
Johnston, H. R., with others, analogue computer for tenth-degree algebraic equations, 2548
Jolliffe, S. A. W., and J. D. Peat, panoramic reception, 1770
Jones, A. Taber, acoustics bibliography, 602, 924, 2114, [illegible]
Jones, F. B., with others, design of networks for constant delay, 3368
Jones, F. E., radar and study of atmosphere, 2526
Jones, H. Spencer, daily magnetic-activity figures *C*, Abinger, July–Sept. 1948, 1043, Oct.–Dec. 1948, 2222; sudden commencements, Abinger, Oct.–Dec. 1947, 378, Jan.–June 1948, 709, July–Sept. 1948, 1043, Oct.–Dec. 1948, 2222; sunspots, magnetic storms and r.f. radiation, 1653; three-hour *K*-indices, Abinger, Oct.–Dec. 1947, 378, Jan.–June 1948, 709, July–Sept. 1948, 1043, Oct.–Dec. 1948, 2222
Jones, R. F., low-level atmospheric ducts, (D)2033; superrefraction over land, 2239
Jones, S. S. D., and J. Brown, metal delay lenses, 1868
Jones, T. F., with F. Klein, sonar in harbour defence and landing operations, 1670
Jones, T. I., radio measuring techniques below 300 Mc/s, (A)426
Jones, T. K., R. A. Scott and R. W. Sillars, SiC semiconductors, 3168
de Jong, J., maintenance measurements for carrier telephony equipment, 1966
Jonker, J. L. H., secondary emission in output valves, 2969
—— and A. J. W. M. van Overbeek, control of electron beam by intersecting beam, 3294
Jordan, E. C., and J. J. Meyers, d.f. system test equipment, 2675
Josephson, B., impedance measurements for dm λ, 1718
Josse, E., and R. Tellier, use of a de Sauty bridge for fault finding in cables, 283
Jouguet, M., wave propagation in nearly circular waveguides, 968

Joyet, G., and M. Simon, temperature effect in alcohol-argon-filled G-M tubes, (A)1140
Jullien, M. A., very-wide-band response curve tracer, (A)777
Juster, F., calculation of stagger-tuned circuits, 2769; input-impedance variations of television-amplifier pentodes, 2395; television receiver, with rimlock valves, a.f.c. and a.ph.c., 3280, with miniature valves, for 450 or 819 lines, 2932

K

Kahan, T., diffraction and perturbation fields in waveguide, 1585
—— and G. Eckart, propagation in atmospheric duct, 1466, 1467; propagation of e.m. waves above ground, 2892
—— with G. Eckart, internal reflection of e.m. waves in stratified medium, 2605; radiation of dipole above plane earth, 951
Kai Chia Cheng. See Cheng, Kai Chia.
Kaiser, T. R., and J. L. Tuck, air-cored synchrotron, 1149
Kalantarov, P., and L. Zeitlin, iterative impedance and resonance curve of recurrent circuit, 3067; resonance phenomena in recurrent circuits, 3089
Kalinin, V. I., and G. M. Gershtein, dynatron effect in multi-segment magnetrons, 2971
Kallmann, H. E., high-power sawtooth current synthesis from square waves, (A)1612; television aerial and r.f. distribution systems for apartment houses, 243
Kammer, E. W., T. E. Pardue and H. F. Frissel, determination of elastic constants for β-quartz, 738
Kämmerer, H., frequency dependence of distortion for coils with commercial laminated-iron cores, 2738
Kammerloher, J., pre-magnetized choke coils, 29
van Kampen, N. G., asymptotic treatment of diffraction, 3119
Kamphoefner, F. J., and J. M. Pettit, low-power wide-tuning-range u.h.f. oscillators, (A)1612
Kandoian, A. G., and A. M. Levine, u.h.f. multiplex broadcasting system, 2829
—— R. T. Adams and R. C. Davis, v.h.f. airborne navigational receiver and aerial system, (A)1672
—— W. Sichak and R. A. Felsenheld, high gain with discone aerials, 303
Kane, F., with others, microwave impedance bridge, 2566
Känzig, W., with others, domain structure of $BaTiO_3$ crystals, (A)1089; production and investigation of $BaTiO_3$ single crystals, 1689
Karsten, O., with H. Norinder, resistance and power in artificial-lightning paths, 2798
Kasner, E., incremental phase splitter, 2864
Katz, H. W., with H. C. Roberts, servomechanisms for control of testing machine, 530
Kaufman, A. B., high-speed revolution counter, 468
Kay, F., with others, transmission-line impedance measurement, 2264
Kaye, G. W. C., and T. H. Laby, Tables of Physical and Chemical Constants, [illegible]
Kaye, M. W., with F. J. Wylie, operational value of shipborne radar, 2803
Kazakevitch, V. V., approximate integration for oscillatory systems with one degree of freedom, 3068
Kazantsev, A. N., ionospheric absorption, 2305
Kaznacheev, Yu. I., nonlinear distortion and noise in u.h.f. diodes, 2386
Keen, A. W., frame synchronizing signal separators, 1205; television timebase linearization, 3098
Kegel, K., surface treatment of steel by h.f. induction heating, 1143
Keith, C. R., with H. F. Hopkins, theatre loudspeaker system, 631
Keith, R., with others, quartz-crystal chronometer, 1112
Keithley, J. F., decade-gain isolation amplifier, 2190
Keitley, R., dielectric heating at cm λ, 2288
Kelar, J., with others, 16-in. metal kinescope for television, 2399
Kell, R. D., television transmitter carrier synchronization, (A)1810
—— and G. L. Fredendall, standardization of transient response of television transmitters, 2063
Kelleher, K. S., with R. J. Adams, diffraction pattern from elliptical aperture, (A)1578
Keller, A. C., submarine detection by sonar, 726
Keller, H. B., and J. B. Keller, reflection and transmission of e.m. waves by spherical shell, 2503
Keller, J. B., with H. B. Keller, reflection and transmission of e.m. waves by spherical shell, 2503
Keller, K. J., with J. M. W. Milatz, effect of valve noise on accuracy of linear amplifiers, 1229
Kelly, J. M., with F. J. Beck, magnetization in perpendicular direct and alternating fields, 1410
Kelso, J. M., height of reflection in curved ionospheric layer, 3423; phase difference between two waves reflected from ionosphere, 1474
—— with J. E. Hacke, Jr, approximate solution of ionosphere reflection problems, 1050
Kennedy, R. C., with E. D. Goodale, phase and amplitude equalizer for television, 1893
Kerkhof, F., with J. Haantjes, projection-television receiver, deflection circuits in, 2934, 3275, synchronization, 3275, 3569
—— with G. J. Siezen, projection-television receiver, 25-kV supply for, 1306, 3275
Kerns, D. M., efficiency of microwave bolometer mounts, 3471
Kerns, Q. A., with others, e.m. deflector for beam of 184-inch cyclotron, 472
Kerr, F. C., C. A. Shain and C. S. Higgins, moon echoes and penetration of ionosphere, 2030
Kerr, F. J., coastal superrefraction in Australia, 2897
Kershaw, W. L., with others, rectified a.c. system for aircraft, 1803
Kersten, J. A. H., and H. Brinkman, direct-reading hot-wire vacuum gauge, 1947
Kesavamurthy, N., with others, h.v. measurement by oscillating electrode systems, 780
Kesselring, R., transmitting and rectifier valves, 248
Kessler, W. J., effective and circuit bandwidths, (A)3074; transient-response equalization for networks, 2166
Kettel, E., signal/noise ratio in p.c.m. systems, 3552; waveguide with phase velocity < *c* for the E_{10} wave, 2431
Keuffel, J. W., chronotron-type timing circuit, 2829
von Keussler, V., review of optical methods of solar research, 1363
Keye, W. R., with others, 100-W 1000-Mc/s grounded-grid triode, 569
Khanov, B. A., theory of aperiodic amplifiers, 2484
Khatskelevich, V. A., with A. Z. Fradin, effect of asymmetry in Adcock aerial systems, 1293
Khavkin, G. A., theory of oscillator using cathode-coupled amplifier, 1334
Khvostikov, I. A., luminescence of atmosphere, 1936
Kiebitz, F., illustration of dipole radiation, 950
Kiernan, E. F., vacuum-capacitor voltage dividers, 3478
Kilburn, T., with F. C. Williams, charged c.r. tube screens as memory devices in calculating machines, (A)1110, 2858; electronic digital computers, 759
Kilvington, T., with H. T. Mitchell, P.O.P.I. hyperbolic navigation aid, 95
—— with others, construction of zenithal-equidistant maps, 591
King, A. J., Physical Society symposium on sound transmission and noise, 634
King, D. D., aerial radiation scattering, 3046
King, E. J., with F. Hamburger, Jr, recording photometer for c.r. tube displays, 1196
King, R., with C. H. Papas, surface currents on conducting sphere excited by dipole, 1592
King, R. W. P., with D. G. Wilson, measurement of aerial impedance using a receiving aerial, (A)2558
Kirby, H. O. B., s.s.b. R/T for ships, 1798; time-sharing multiplex system, 3546
Kirby, T., twin oscillator, 3379
Kirke, H. L., ground wave field strength over composite land and sea path, 2304; television definition and bandwidth, 542
Kirkpatrick, C. B., influence of vertical ionic drift on Chapman region, 2793
Kirschstein, F., and D. Weber, frequency stabilization of f.m. u.s.w. transmitters, 1221
Kisun'ko, G. V., excitation of waveguides, 3096; natural frequencies of irregular cavity resonators, 896
[illegible], J. W., Jr, test sets for dielectric faults in coaxial cables, 431
Kiver, M. S., Television and F.M. Receiver Servicing, (B)511
Klages, G., effect of slits in walls of metal waveguides, [illegible]; optimum design of cylindro-parabolic reflectors, 1862

Klasens, H. A., W. Ramsden and Chow Quantie, ZnS phosphors, **(C)1404**
Klauser, H., impedance valves for f.m., **1823**
Kleen, W., distributed amplification, **1389**; interaction of electron beam and e.m. waves, **3580**; sensitivity of amplifier stages, **1388**, **2188**; sensitivity limit of basic valve circuits, **3362**
—— with O. Doehler, travelling-wave valve, effect of space charge in, **251**, efficiency of, **2953**, nonlinear phenomena in, **250**, theory of, **2069**, **2381**, **2669**
—— with H. Huber, electron beams of high current-density in e.s. fields, **3577**
—— with others, travelling-wave valves as wide-band oscillators, **1830**
Klein, E., and T. F. Jones, sonar in harbour defence and landing operations, [illegible]
Klein, P. E., Elektronenstrahloszillographen, **(B)2280**
Klein, W., directional transmission investigations in the Alps, **2326**; dual circuits, **33**; tuned valve-voltmeter in carrier-frequency technique, **150**; u.s.w. multichannel telephony systems, **3543**
Kleinwächter, H., and H. Wojtech, graphical determination of oscillation phenomena, **989**
Kleis, D., and M. van Tol, facsimile transmitter and receiver synchronization, **2925**; high-speed facsimile transmission, **2923**
—— F. C. W. Slooff and J. M. Unk, transmitter for high-speed facsimile, [illegible]
—— with others, high-speed facsimile equipment, **2338**
Kliever, W. H., and R. R. Syrdal, magnetic compass with c.r. sensing element, **799**
Kline, M., Bessel equations and waveguide theory, **416**
Klinger, H. H., microwave absorption in atmosphere, **2032**; normal and abnormal u.s.w. refraction, **2031**
Klinkhamer, J. F., filter design by means of electrolyte-tank measurements, **2750**
von Klüber, H., magnetic field of heavenly bodies, **1655**
Kniazeff, G., marine radar, **2235**; test equipment for television receivers, (A)795
Knight, C. R., and A. P. Haase, low-noise a.f.-input valve, **3393**
Knight, H. de B., measurement of deionization time of thyratrons, **3186**
—— and O. N. Hooker, hot-cathode hydrogen-filled thyratron, **2392**
Knight, S. F., balance for stability tests on permanent magnets, **3470**
Knipp, J. K., electron-velocity-dependent characteristics of h.f. valves, **2974**
Knol, K. S., with J. M. van Hofweegen, universal adjustable u.h.f. transformer, **981**
Knoll, M., electron microscope, **2368**; electron optics, **2205**
Knudsen, V. O., J. V. Wilson and N. S. Anderson, attenuation of sound in fog and smoke, **614**
Kock, W. E., path-length lenses for microwaves, **3058**
—— and R. L. Wallace, Jr, coaxial transistor, **2406**
Koehler, J. S., electronic differential analyser, **758**
Koenig, W., new scale for a.f. frequency plotting, **3319**
Kofink, W., reflection of e.m. waves at inhomogeneous layer, **3231**
Kohman, G. T., with A. C. Walker, growth of EDT crystals, **2530**
Kolomiets, B. T., frequency characteristics of PbS photocells, **1536**; synthetic Bi_2S_3 photocells, **2973**
Kolster, F. A., wide-band aerials for television and f.m. reception, **305**, **(C)645**
Koppelmann, F., measurement of fundamental and harmonics, **1429**; transformer voltage-drop measurements, **3464**
Koren, H. W., application of activated ceramics in transducers, **(A)1269**, **2128**
—— with L. G. Hector, ceramic gramophone pickup, **935**
Korn, G. A., stabilization of simultaneous-equation solvers, **3348**
Korol'kov, N. V., and G. K. Kuz'minok, integrator for linear differential equations with constant coefficients, **1424**
Korringa, J., R. Kronig and A. Smit, reflection of sound by porous media, **1850**
Koschel, H., electrical methods of sound analysis, **1256**
Kosenko, V. E., and E. G. Miselyuk, AgS photocells, **1534**
Kostashuk, S. S., with others, cardiochronograph, **1153**
Kosten, C. W., sound absorption by porous materials, **3017**
—— with D. H. Bekkering, measurement of sound absorption at low frequencies, **936**
—— with V. F. Schut, permissible nonlinear distortion in amplifiers, **3107**
—— with others, sound absorption by porous materials, **1569**
Kotter, F. R., galvanometer connection for maximum Wheatstone-bridge sensitivity, **152**
Kramer, J., counter for investigation of metal surfaces, **3213**
Krasil'nikov, V. A., fading, and pulsations in atmospheric temperature, **2024**
Krasnushkin, P. E., and E. R. Mustel', radiation of oscillations from cavity resonator through aperture, **1329**
Kraus, J. D., helical aerials, **1860**, wide-band, **306**
—— and J. C. Williamson, radiation of helical aerials in axial mode, **643**
—— with O. J. Glasser, impedance of helical aerials, **650**
Krauss, H. L., and P. F. Ordung, distortion and bandwidth characteristics of p.m., **846**
—— with L. A. Goldmuntz, cathode-coupled clipper circuits, **198**
Kretzmer, E. R., interference characteristics of p.t.m., **(A)1785**; phase measurement at a.f., **3483**
Kreuzer, J., valve galvanometer with ordinary valves, **3201**
Krieg, O., with G. Herrmann, effect of gases and vapours on emission of oxide cathodes, **2955**
Krieger, G. L., with others, image-brightness intensifier, **469**
Kroebel, W., measurement of rapid phenomena, **141**
Kröger, F. A., and W. Hoogenstraaten, decay and quenching of fluorescence in willemite, **3156**
—— and others, influence of temperature quenching on fluorescence decay, **3157**
Kroll, N., with others, rising-sun magnetrons, **1553**
Kroll, N. M., and W. E. Lamb, Jr, resonant modes of rising sun magnetron, **910**
Krom, M. E., electronic timer, **2830**
Kron, G., models for linear partial differential equations, **1706**
Kronig, R., system of linear harmonic oscillators, **986**
—— with others, reflection of sound by porous media, **1850**
Krüger, C. E., radio spectra of sun and milky way, **1366**
Kruglov, N. G., auto-anode modulation for broadcast transmitters, **2632**
Krumhansl, J. A., and R. T. Beyer, theory of magnetic amplifiers, **2730**
Kruse, F., use of f.m. ultrasonic oscillations for acoustic absorption measurements, **2693**
Kurie, F. N. D., vacuum systems, seals and valves, **409**
Kurshan, J., transitrol, **1541**
Kuteynikov, S. E., keying transmitters from great distances, **1223**
Kuz'minok, G. K., with N. V. Korol'kov, integrator for linear differential equations with constant coefficients, **1424**
Kyame, J. J., wave propagation in piezoelectric crystals, **2201**

L

Labate, S., with others, acoustic reactance of small circular orifices, **2701**
Labin, E., wide-band television transmission systems, **2342**
Laby, T. H., with G. W. C. Kaye, Tables of Physical and Chemical Constants, **(B)1922**
Lacharnay, S., synchronization in broadcasting, **527**
Lacy, L. Y., with A. J. Aikens, test of 450-Mc/s urban-area transmission to mobile receiver, **(A)1757**
—— with W. R. Young, transmission at 450 Mc/s to mobile radio units, **(A)1757**
Ladner, A. W., analysis and synthesis of musical sounds, **3323**
Laffineur, M., and R. Servajean, exceptional solar radiation during 8th May 1949, **3129**
—— with J. Houtgast, dm-λ solar radiation perturbations, **696**
LaGrone, A. H., with others, method of determining angle of arrival, **1481**
Lahmeyer, G., with H. Israël, atmospheric potential gradient, **1065**
Lakaye, L., electrical applications of dimensional analysis and of principle of similitude, **60**
Lallemand, A., electron multipliers, **(A)896**, **3297**
Lamb, J., and A. Turney, dielectric properties of ice at λ 1.25 cm, **2532**
Lamb, W. E., Jr, with N. M. Kroll, resonant modes of rising-sun magnetron, **910**
Lamberts, K., with L. Pungs, modulation and keying, **2361**
Lamm, A. U., theory of magnetic amplifier, **656**
Lamm, U., the transductor and rectifier control, **3065**
Lamont, H. R. L., atmospheric absorption of mm waves, **1028**
Lamson, H. W., null detectors for impedance bridges, **784**
Lance, T. M. C., television in U.S.A., **1211**
Landon, V. D., analysis of multiplex transmission systems, **515**
Lane, J. A., with J. A. Saxton, 1.25-cm absorption in supercooled water, **2596**
Lane, W. C., and T. C. Clark, v.h.f. single-channel receiver for airports, **201**
Lange, R. W., measurement of high-Q cavities at 10 kMc/s, **770**
Langford-Smith, F., operating conditions of RC-coupled pentodes, **2394**
Langmuir, R. V., with others, 70-MeV synchrotron, **2594**
Laplume, J., instantaneous frequency, **826**; optimum response of circuit to Heaviside pulse, **3363**; phase distortion, in coupled circuits, **1328**, in stagger-tuned amplifiers, **681**; radio links for television and multiplex R/T, **(A)850**; response curve of quadripole, **40**; theory of travelling-wave valve, **2379**
Lapostolle, P., delay lines for travelling-wave amplifiers, **39**; propagation of e.m. wave in presence of two electron beams, **1583**
Lark-Horovitz, K., properties of Ge and Si, **(A)1681**; semiconductors, **(A)413**
LaRocque, A. P., with H. Jacobs, effect of Ba compounds on cold-cathode behaviour, **(A)1824**
Larson, D. A., with F. J. Studer, emission spectra of ZnS-CdS phosphors, **(D)734**
Lashkarev, V. E., boundary layers between metals and semiconductors, **1411**
Lassen, H., double refraction of e.m. waves in ionosphere, **3232**
Latmiral, G., with G. Barzilai, diversity reception for u.s.w. radio links, **1468**
Latreille, A., and M. Zweguintzow, h.f. telecommunications on power lines, **3540**
Lattimer, C. T., with others, 16-in. metal kinescope for television, **2399**
Lauber, A., with others, transmission of wide a.f. band, **1787**
Lauter, E., with G. Falckenberg, space-wave absorption and large-scale weather conditions, **2037**
Laver, F. J. M., c.r. frequency comparator for 1-kc/s substandard tones, **3194**
Lavoo, N. T., diode noise characteristics for large transit angles, **2387**
Law, R. R., electronics of u.h.f. triodes, **2100**
—— W. B. Whalley and R. P. Stone, television transmitter for 500–900 Mc/s, **1531**
Lawrence, H. C., high-power u.h.f. transmitter, **2360**
Lawrence, W. L., television equipment for broadcasting stations, **889**
Lawson, A. W., with J. B. Garrison, efficiency of radiation shields, **1022**
Lawson, D. I., and E. R. Rout, pulse deviation meter, **787**
Lawson, J. D., with P. M. Woodward, arbitrary polar diagram from source of finite size, **302**
Lawton, E. J., choice of operating mode for linear accelerators, **1451**
—— and W. C. Hahn, standing-wave type linear accelerators for electrons, [illegible]
Learned, V., synchrodyne modulation of klystrons, **(A)1822**
Lebacqz, J. V., short-time oscillography, **444**
—— and D. H. Andrews, r.f. properties of CbN, **2531**
—— with G. N. Glasoe, Pulse Generators, **(B)917**
LeBel, C. J., subminiature design techniques for preamplifiers, **2490**
Lebert, A. W., with others, pulse echo measurements on cables, **790**
Le Boiteux, H., electronic telecontrol of artillery, **3515**
Leconte, R. A., and others, carrier system with 8-kc/s bandwidth, **2905**
Ledig, P. G., Cheltenham K-indices, April–June 1948, **708**, July–Sept. 1948, **1044**, Oct.–Dec. 1948, **2221**, Jan.–March 1949, **3419**
Lee, E. M., radio component industry's activities, **(D)353**
Lee, R., rectifier ripple-reducing filter chart, **(A)1612**
Leed, D., with D. A. Alsberg, phase and insertion-loss measuring equipment for video frequencies, **2836**
Lees, R. J., C. H. Westcott and F. Kay, transmission-line impedance measurement, **2264**
van Leeuwen, H. J., permeability decrease with increasing frequency, **1953**
Lefèvre, P., with M. Demontvignier, stability criteria for linear systems, **3127**
Legros, R., slave-frequency pulse generator, **1899**
Lehan, F. W., transistor oscillator for telemetry, **3095**
Lehmann, G., design theory for h.f. transmitting valves, **(A)903**; electricity and servomechanism technique, **1194**; electronic telecontrol of artillery, **3515**
Lehovec, K., hole current in Ge transistor, **3599**; photovoltaic effect, **73**; testing transistors, **2863**
Leitch, J. G., WCAU-TV station, Philadelphia, **2936**
Leites, R. D., transient processes in detection, **1301**
Leithäuser, G., ionospheric disturbances and terrestrial effects, **1930**
Leitner, A., diffraction of sound by circular disk, **3001**
Lejay, P., m.u.f. forecasting, **191**
—— and D. Lepechinsky, distribution of field reflected by ionosphere, **1164**
Lenehan, B. E., s.s.b. carrier system for power lines, **834**
Lengyel, B. A., interferometer for microwave measurements, **(A)1713**
Lenihan, J. M. A., velocity of sound in free air, **927**
Lennartz, A., band filters in amplifiers, **2493**; i.f. amplifier networks, **1002**
Lennartz, H., with H. Boucke, beat-frequency oscillator for carrier frequencies, **3208**
Leonhard, A., stability criterion for control circuits, **3347**
Leonhardt, R., with L. Rohde, telesynchronization with standard frequency, [illegible]
Le Page, L. S., with F. Parker, operational factors for marine radar, **2803**
—— with D. Quinn, monitoring of homing and blind-approach equipment, **159**
Le Parquier, G., pulse methods for cable fault location, **282**
Lepechinsky, D., with P. Lejay, distribution of field reflected by ionosphere, **1164**
Leprêtre, R., frequency swing with reactance valves, **2182**; new synthetic insulating materials, **120**
Leroux, M., miniature American-type valves made in France, **2079**
Leroy, R., synthesis of general passive quadripoles, **1886**
Lesage, M., A. Rogozinski and A. Voisin, construction of metal G-M counters, **2871**
Leslie, J. R., with others, ultrasonic absorption in sea water, **612**
Létienne, R., double-triode oscillator, **47**
Leverenz, H. W., phosphors, **1949**
Levin, A., and A. C. D. Haley, design of marine radar equipment, **3146**
Levin, H. Ya., multiple resonance in split-anode magnetrons, **2972**
Levin, M. L., propagation in multi-layer medium of periodic structure, **1281**
Levine, A. M., and D. D. Grieg, terminal equipment for pulse-time multiplex, **(A)2828**
—— and M. Hoberman, 50-Mc/s wide-band oscilloscope, **(A)1713**
—— with A. G. Kandoian, u.h.f. multiplex broadcasting system, **2829**
Levine, D., principles of volume scan for radar, **(A)1672**
Levy, M. M., with others, pulse testing of wide-band networks, **(D)2862**
Lewin, L., e.m. radiation from waveguides and horns, **3041**; reflection cancellation in waveguides, **3037**; reflections from flat sheet and angle reflectors, **1162**
Lewis, I. A. D., and A. C. Clark, meter for small voltages and currents, **1996**
Lewis, R., ad hoc committee report on f.m. and television propagation problems, **3524**
Lewis, W. D., waveguide branching filter, **294**
Liang, P. H., H. L. Lung and S. Wang, ionospheric data, Wuchang, Sept. 1946–Dec. 1947, **716**
Libois, L. J., stagger-tuned amplifier design, **2193**
Liebermann, L. N., origin of sound absorption in fresh and sea water, **613**
Liebmann, G., e.s. field near circular aperture or short cylinder, **64**; solution of partial differential equations by means of resistance networks, **3460**
Liebson, S. H., characteristics of halogen counters, **3496**; discharge spread in G-M counters, **162**
van Liempt, J. A. M., and W. D. van Wijk, breakdown voltage in rare-gas/nitrogen mixtures, **1972**
Liénard, P., sound field of point source in perfect fluid, **1839**
Light, L. H., hum reduction in valves, **(D)1241**
Lightbody, A., with others, conductive plastic materials, **(A)1681**
Lind, D. A., multicellular G-M counter, **2872**
Lindberg, L., theory and applications of trochotrons, **2063**
Lindenhovius, H. J., and J. C. van der Breggen, h.f. permeability and loss measurement, **144**
Lindsay, E. W., and L. J. Berberich, electrical properties of ceramics, **(A)1682**
Lindsay, H., and M. Stolaroff, magnetic-tape recorder, **278**
Lindsay, R. B., with others, scattering of ultrasonic waves in water by cylindrical obstacles, **609**
Linfoot, E. H., applications of optics in astronomy, **1019**
Linke, J., delay networks from low-pass units, **38**
Linvill, J. G., broad-band active networks, **(A)1612**
Lion, K. S., and J. W. Sheetz, r.f. gas-discharge phenomenon and mechanical measurement, **(A)1733**
Liot, L., h.f. heterodyne frequency meter, **2001**; stable generator for 3.5-Mc/s and 7-Mc/s bands, **1383**
Little, R. V., Jr, large-screen television, **2651**, developments in, **237**
Loach, B. G., with L. B. Mullett, corrugated waveguides for linear electron accelerators, **175**
Löb, E., subjective effect of sound-spectrum variations, **3007**
Locanthi, B. N., with others, electronic techniques for analogue computers, **3176**
Locher, F., filters and filter problems, **1618**
Lodge, J. I., and R. W. Stewart, h.f. discharges in rarefied gases, **362**
Loeb, L. B., mechanism of lightning discharge, **90**
—— with W. N. English, point-to-plane corona onset potential, **3405**
Löfgren, E., approximate formula for inductance of circular coils, **3356**
Logan, F. G., saturable reactors and magnetic amplifiers, **314**
Lombardini, P., with N. Carrara, radiation pressure of cm waves, **1759**
London, A., sound transmission through homogeneous walls, **3326**
Long, A. G., glass/metal seals, **1974**
Lopukhin, V. M., travelling-wave valve, **2380**
Lord, R. D., random vectors, **1018**
Loshakov, L. N., wave propagation along spiral line with electron beam, **2666**
Loucks, W. W., S. S. Kostashuk and A. C. Burton, cardiochronograph, **1153**
Loughlin, B. D., with others, superregenerator design, **499**
Loughridge, D. H., with G. E. Hagen, testing efficiency of G-M counters, **461**
Loukovski, A., with others, forced-air cooling of transmitting valves, **2377**
Love, A. W., diode noise generator at u.h.f., **567**, **(D)1832**
Lovell, A. C. B., effect of meteors on radio, **(A)370**
—— with others, daylight meteor streams, May–Aug. 1947, **76**
Lovell, B., Electronics and their Application in Industry and Research, **(B)3516**
Lowe, C. E., amplitude-selective amplifier, **344**
Luck, D. G. C., wide-band phase-splitting networks, **1614**
—— with I. Wolff, f.m. radar applications, **399**
Ludeke, C. A., equivalent linearization of nonlinear oscillatory systems, **3456**
Lüdi, F., turbator single-cavity magnetron, **1556**
Lukoff, H., with others, dynamically regenerated memory tube, **(A)1703**
Lund, C. O., broad-band transition from coaxial cable to helix, **(A)1578**
Lundahl, W. N., X-ray thickness gauge, **2580**
Lundqvist, S., angular momentum of sun, **695**
Lung, H. L., seasonal variation in F_2-layer ionization, **3427**
—— with others, ionospheric data, Wuchang, Sept. 1946–Dec. 1947, **716**
Lunge, G. S., with others, telemeter for carrier-current channels, **2588**
Lurie, W. B., Citizens' Radio wavemeter, **3482**; high-speed trigger circuit, [illegible]; versatile tone control, **944**
Lüscher, E., and J. Zwislocki, adaptation of ear to sound stimuli, **2702**
Lutz, K., 300-W s.w. transmitter Type SK23A, **552**
Lutz, S. G., and S. J. Tetenbaum, electron tube for viewing magnetic fields, **2375**
Luzhinskaya, M. G., with others, magnetic structure of alnico, **1955**
Lynch, A. C., improvement of Q-meter accuracy, **1992**
Lynch, E. E., H. C. Thomas and G. S. Lunge, telemeter for carrier-current channels, **2588**
Lynch, W. A., with others, broad-band signal generator, **2576**
Lyon, J. A. M., and C. E. Williams, alkali-amalgam cathodes for power valves, **2670**
Lyons, H., atomic clock, **2549**
—— with B. F. Husten, microwave frequency standards, **(A)1712**, **2552**
Lyttleton, J. W., with others, photoelectric acoustic spectrograph, **1844**

M

Maarleveld, F., crystal filters for radiotelegraphy receivers, **1892**
MacDonald, D. K. C., Brownian movement and spontaneous electrical fluctuations, **61**; fluctuation noise in receivers, **(A)506**; network analysis involving realizable filter functions, **686**; theory of electrical fluctuations, **(D)1247**; transit-time deterioration of space-charge reduction of shot effect, **2408**
—— with B. Frankenhaeuser, galvanometer amplifier, **2844**
Macek, O., rectifier-voltmeters, **3474**; voltage division for cm and mm waves, **2733**
Macfadyen, K. A., and W. D. Edwards, dielectric strength of liquids for short voltage pulses, **1694**
Machen, G. F., with D. G. Tucker, constancy of small rectifiers, **657**
Macht, H. G., new German periodicals, *Zeitschrift für Meteorologie* and *Deutsche Hydrographische Zeitschrift*, **918**
MacKay, D. M., projective 3-dimensional displays, **3305**
—— with E. M. Deeley, electronic-analogue multiplication and division, **1977**
MacKenzie, K. R., and others, r.f. system of 184-in. cyclotron, **2016**
—— with others, pulsed oscillator for f.m. cyclotron, **2017**
MacLean, N. W., with W. J. Tull, ground position indicator, automatic navigational computer, **1896**
MacNair, D., with others, semiconducting properties of (Ba, Sr)O, **3444**
Macnamara, T. C., and P. A. T. Bevan, televising the 1949 Oxford and Cambridge boat race, **2343**
Macnee, A. B., electronic differential analyser, **(A)1703**
MacNichol, E. F., Jr, with others, Electronic Time Measurements, **(B)3491**; Waveforms, **(B)2006**
MacRae, D., Jr, with others, Electronic Instruments, **(B)454**
Macrae, W., with others, power diodes, **531**
MacRobert, T. M., Spherical Harmonics, **(B)3181**
Maduell, C. R., Jr, and H. M. Owen, carrier-type d.c. amplifier, **3385**
Maecker, H., boundary-layer waves in optics, **3116**
Maedel, G. F., Basic Mathematics for Radio, **(B)423**
Maggio, J. B., with others, pulse echo measurements on cables, **790**
Maginniss, F. J., with A. C. Cook, differential analyser applications, **3457**
Magnan, C., proton microscope, **2599**
Magnuski, H., cavity resonators in mobile communications, **3378**
de Magondeaux, R., transmission-line oscillator with ordinary valves, **3094**
Maguer, P., ionosphere-sounding equipment, **2069**
Mahanti, P. C., and S. S. Mandal, electrical properties of Indian mica, **744**
Mahl, H., infra-red image converter, **1147**; scanning principle in ultra-microscopy, **3512**
—— and A. Recknagel, aperture errors of e.s. electron lenses, [illegible]
Mahlman, G. W., work functions and conductivity of oxide cathodes, **2094**
Mahoney, W. J., disk recording for broadcasting stations, **1856**
Maier-Leibnitz, H., quenching circuit for G-M counters, **329**
Maillard, J., u.h.f. aerials, **2143**
Mailley, J., French telecommunications networks, **1492**
Maine, A. E., stabilization unit for mains voltage, **3268**
Makar, R., with others, electrolyte tank for measurement of steady-state and transient response of networks, **2743**
Makinson, R. E. B., with E. E. Salpeter, dielectric properties of gas discharge, **1917**
Malézieux, J., and R. Sueur, repeater-station equipment, **1493**
Mallach, P., dielectric-rod aerials, **1604**
Mallein, S., television and the cinema, **(A)878**
Malmfors, K. G., theory and applications of trochotrons, **2063**
Malmlöw, G., aging of cellulose insulating materials, **1693**
Maloff, I. G., optical problems in large-screen television, **238**
Malsch, J., ionosphere, polarization in, **1465**, structure of, **1048**
Malvano, R., generalized quadripoles, **1816**; waveguides, **3085**
Mamyrin, B. A., and L. N. Sosnovkin, experimental investigation of quartz crystals, **412**
Manaev, E. I., bandwidth and distortion of f.m. signals, **1177**
Managan, W. W., design of G-M counter for high counting rates, **(A)1733**
Mandal, S. S., with P. C. Mahanti, electrical properties of Indian mica, **744**
Manière, M., with G. Delyon, stabilized oscillator for multiplex telegraphy, **209**
Mankin, A. H., with J. S. Prichard, aerial polar diagrams for aircraft in flight, **(A)307**
Manley, J. M., synchronization for p.c.m. receiver, **1768**
Manning, L. A., reliability of ionosphere height determinations, **2515**; theory of radio detection of meteors, **1392**
—— O. G. Villard, Jr, and A. M. Peterson, Doppler investigation of meteors, **2801**

Mansberg, H. P., camera for c.r.o., 1201
—— with C. Berkley, photographic techniques in c.r. oscillography, (A)1800
Mansion, D. D., experiments on cylindrical cavity resonators, 997
Many, A., and S. Meiboom, network for determining eigenvalues of matrix, 131
Marchand, É., fault finding on underground cables by ground vibration, 289
Marchant, E. W., and A. C. Robb, testing small servomechanisms and data-transmission systems, 2329
Marchant, R., recording-tape characteristics, 3029
Marcus, A., Radio Servicing: Theory and Practice, (B)3396
Marcuvitz, N., equivalent circuits for coupling of waveguides by apertures, (A)1578
Margenau, H., pressure broadening of NH_3 inversion spectrum, 3409
Margolin, S. D., skin effect in steel sheets, 1353
Mariani, J., magnetism of celestial bodies and gravitation, 1039
Marinescu, M., simplified magnetic amplifier, (D)1304
Markus, J., and V. Zeluff, Handbook of Industrial Electronic Circuits, (B)1345
Marrison, W. A., evolution of quartz clock, 762
Marshall, B. O., Jr, isograph for solving algebraic equations, (A)1703
Marshall, F-H., with J. W. Coltman, photomultiplier radiation detector, 460
Marshall, J. G., impedance matching with line segments, 37
Marshall, J. H., with W. Struszynski, symmetrical screened transformers for h.f. d.f., 969
—— with others, performance of h.f. direction finders in ships, 1063
Marston, A. E., and M. D. Adcock, theory of end-fire helical aerials, (A)1578
Martin, A. V. J., elementary theory of klystron, 1245; positive-grid oscillators, 46
Martin, J., thyratrons and their applications, 257
Martin, J. H., 30-MeV hospital synchrotron, 3223
Martin, K., calculation of attenuators, 983
Martin, O., search apparatus for metal, 185
Martin, S. L., with others, mechanism of emission from oxide cathodes, 253
Martinot-Lagarde, A., similitude of valves, 902
Marton, L., Advances in Electronics, (B)2889; electron microscopy, 1454
Martyn, D. F., atmospheric tides in the ionosphere, 1052, 1053, 1685; daily geomagnetic variation near equators, 1927; electrical conductivity of ionospheric D region, (D)85
Marx, E., spark transmitters for cm λ, 2175
Marzin, P., future of French telecommunication network, 1496
Mason, W. P., $BaTiO_3$ as electromechanical transducer, 3439; electrostriction in $BaTiO_3$ ceramics, 1088; Electromechanical Transducers and Wave Filters, (B)2712
Massey, H. S. W., and D. R. Bates, atomic oxygen in upper atmosphere, 1379
Masson, E., fault finding in underground cables, (D)287
Masters, R. W., power-equalizing network for aerials, 3052
Masterson, E., 35-mm magnetic recorder, 633
Mataré, H. P., background noise of crystal diodes, 2976
Mather, N. W., analysis of triple-tuned coupled circuits, (A)1612
—— with A. E. Harrison, graphical analysis of tuned coupled circuits, 3377
Mathers, G. W. C., theory of r.f. h.v. supplies, 1807
Mathis, H. F., with others, open-ended-waveguide radiators, 2432
Matte, A. L., with J. R. Davey, frequency-shift telegraphy, 840
Matthäi, R., phase-shift control for auxiliary-circuit supplies, 972
Matthias, B. T., with J. M. Richardson, theory of dielectric behaviour of $BaTiO_3$, 745
—— with others, dielectric behaviour of $BaTiO_3$, 746
Matricon, M., Allouis OCII s.w. broadcasting station, 1190
Mauchly, J. W., results of tests on the Binac, (A)1703
—— and J. P. Eckert, Jr, electronic computers, (A)419
Maulard, J., velocity of sound in air at low pressures, 3009
Mautner, L., with R. C. Palmer, video amplifier transient response, 3395
Mawardi, O. K., measurement of acoustic impedance, 2700
Maxfield, J. P., auditorium acoustics, 4
Mayer, C. H., with others, solar noise at 9500 Mc/s and coincident flare, 697
Mayer, E. G., with O. B. Sneath, electromedical pulse-generators, 2020
Mayer, H., multilayer photocells, 2945; photoelectric effect, 2205, of atomic layers of K, 2946
Mayr, H., design of RC amplifiers, 1628; feedback amplifiers, in cascade, 1009, design, 3110
McCaig, M., with K. Hoselitz, anisotropic permanent-magnet alloys, Alcomax, 1958, 3453
McCann, G. D., and S. W. Herwald, dimensional analysis of servomechanisms, 853
—— C. H. Wilts and B. N. Locanthi, electronic techniques for analogue computers, 3176
—— with E. L. Harder, Westinghouse and California Institute of Technology computers, 2546
McClintock, M., Rural Radio Network f.m. system, 594
McConechy, E., with others, auroral displays at Saskatoon, Jan./Feb. 1949, 2522
McCord, W. I., mobile television studio for WDTV, 2349
McCormack, R. L., standard diode for oxide-cathode core-material tests, 2675
McCracken, L. G., ionospheric absorption, 2027
McCready, L. L., with R. Payne-Scott, ionospheric effects during dawn solar-noise observations, 1033
McDade, J. R., phantastron delay circuit, 2167
McDonald, A. S., overseas telecommunications services, Australia, 2827
McDonald, D., stabilizing servomechanisms, 856
McEwan, D. H., with others, 20-MeV betatron, 179, (D)2014
McGinnis, G. P., 28-Mc/s mobile equipment, 3261
McGoffin, W. W., and H. R. Schulz, automatic station-call selector, [illegible]
McGuire, P. S., with others, experimental f.m. broadcast transmitter, 1220, 2939
McKenzie, A. A., with others, Loran: Long Range Navigation, (B)106
McKenzie, A. J., f.m. broadcasting in Australia, 2638
McKinley, D. W. R., electromechanical methods of deriving l.f. standards, 2260
—— and P. M. Millman, radar echoes from meteors, 2213
McKinney, C. M., with S. L. Brown, mechanical harmonic synthesis in network analysis, 2460
—— with R. B. Watson, gain and effective area of horn aerials, 1600
McLachlan, N. W., Modern Operational Calculus with Applications in Technical Mathematics, (B)1426
McLaughlin, J. L. A., heterodyne interference eliminator, 1782
McLean, D. A., with H. A. Sauer, direct-voltage performance test for capacitor paper, 3206
McLean, F. C., and R. Toombs, unattended low-power B.B.C. transmitting stations, 223
McLean, W. S., with C. F. Miller, design for a secondary-emission trigger valve, 3070
McLeish, C. W., ionosphere observations during solar eclipse, 9th July 1945, 79
McLeod, T. S., negative-feedback amplifiers, (D)2196, (D)3111
McManus, H., classical electrodynamics without singularities, 1359
McMullen, C. G., with others, train television, 1814
McNish, A. G., and T. N. Gautier, lunar and midday effects in ionosphere at Huancayo, 3426
McPetrie, J. S., and J. A. Saxton, attenuation of u.h.f. e.m. radiation by rock, (D)619
—— and B. J. Starkey, effect of low-level atmospheric ducts on propagation, 2639
—— and B. Starnecki, low-level atmospheric ducts, 1167, (D)2033
—— and others, over-sea propagation for λ 3 cm and λ 9 cm, 2034
McProud, C. G., simplified dynamic noise suppressor, 625; Type 6AS7G 6-W audio amplifier, 1909
Meahl, H. B., absolute accuracy of primary frequency standards, 2551
Means, W. J., with others, airborne magnetometers, 815
Meek, J. M., and F. R. Perry, lightning, 1391
Megaw, E. C. S., and W. E. Willshaw, naval dm-λ communication equipment, 1510
Megla, G., signal generators for dm λ, 158
Meiboom, S., with A. Many, network for determining eigenvalues of matrix, 131
Meier, A. S., and W. P. Summers, impedance of vertical aerials with ground planes, 2440
Meinel, E., distortionless demodulation of s.s.b. oscillations, 2615
Meinke, H. H., application of conformal representation to wave fields, 1645; cm-wave measurement technique, 2554; dm-λ transmission line with visual indicator, 3203; h.f. balancing devices, 1314; h.f. resistance measurement, 139; measurement equipment for dm waves, 3198
Mellen, G. L., vacuum pump design, 2241
von Melsted, S., echo sounder PEK-3G, 2800
Melton, B. S., measurement of surge resistance of a capacitor, 2556
Meltzer, B., electron flow under space-charge conditions, 3120
Mendelssohn, K., superconductivity, 1355
Meng, C. Y., with others, microwave absorption spectrum of oxygen, 3410
Menke, J. R., application of nuclear radiation to industry, (A)1639
Menon, K. B., with others, h.v. measurement by oscillating electrode systems, 780
Mensel, W., recent results of solar investigation, 1651; s.w. fading, 3236
Mercer, K. A., with E. Eastwood, transient radar echoes from ionosphere, 89
Mercier, R., and N. Banderet, ultrasonic absorption by solids, (A)931
Merling, K. B., fluorescent screen for electron microscope, 2293
Mermoz, H., and M. Troublé, hysteresis distortion of Pupin coils, 1168
Merton, G., comets in 1947, 1032
Merz, W., with H. Blattner, anomalies of specific heat of $BaTiO_3$, (A)1090
—— with others, domain structure of $BaTiO_3$ crystals, (A)1089; electrical conductivity and refractive index of $BaTiO_3$, (A)1091; production and investigation of $BaTiO_3$ single crystals, 1689
Merz, W. J., properties of $BaTiO_3$ single-domain crystals, 1963
Messmer, G. R., with others, rural carrier-current telephony, 830
Metson, G. H., poisoning of oxide cathodes, 1548, 3589, by oxygen, 3588
—— and M. F. Holmes, poisoning in high-vacuum oxide-cathode valves, 2092
Metz, F. A., Jr, and W. M. A. Andersen, improved ultrasonic delay lines, 2747
Metzger, S., and D. D. Grieg, pulse-count modulation, 519
Meunier, P., electrical properties of glasses, 1699
Meyer, K. P., with others, high-speed coincidence circuit for multipliers, 167
Meyers, J. J., with E. C. Jordan, d.f. system test equipment, 2575
Michaels, E. L., impedance curves for 2-terminal networks, (A)1612
Michel, J. G. L., differential analyser technique, 1109
Michelsen, P. F., with others, high-sensitivity remanent magnetometer, 3469
Middleton, D., rectification of modulated carrier in presence of noise, 1175; signal/noise ratio in f.m. and a.m. receivers, 2619, (C)3532; spurious signals caused by noise in triggered circuits, 1777
van Mierlo, S., p.m. multiplex telephony, 845
Mihran, T. G., closed-ridge and open-ridge waveguides, 2425; ionospheric-meteorological correlation, 86
Mihu, V. P., absorption of h.f. energy by ionized gases, 71
Milatz, J. M. W., and N. Bloembergen, photoelectric a.c. amplifier with a.c. galvanometer, 1908
—— and K. J. Keller, effect of valve noise on accuracy of linear amplifiers, 1229
—— and others, a.c. galvanometer, 3199
Milazzo, S., with W. Sichak, aerials for circular polarization, 2142
Miles, J. W., coupling of cylindrical tube to semi-infinite space, 607; sound diffraction through circular aperture, 2690
Milholland, H., with T. T. Goldsmith, Jr, television transcription by cinema film, 235, 543
Millar, J. Z., and W. B. Sullinger, microwave system for television relaying, (A)1785
Millar, N. P., with R. M. Rowell, long-scale instruments, 788
Millard, B. S., fitting of radar in ships, 2803
Miller, A. E., frequency-control apparatus, (A)1612
Miller, C. E., with F. J. Brott, KOMO 50-kW a.m. transmitter, 1222
Miller, C. F., and W. S. McLean, design for a secondary-emission trigger valve, 3070
Miller, G. A., and W. R. Garner, masking of tones by repeated bursts of noise, 623
Miller, J. M., Jr, cathode neutralization of video amplifiers, 3393
Miller, S. E., with A. L. Hopper, design of radar i.f. amplifier, (C)3389
Millington, G., deviation at vertical incidence in ionosphere, 1763, (D)2607; ground-wave propagation, over inhomogeneous smooth earth, 1758, across land/sea boundary, 2307, 3233
Millman, P. M., with D. W. R. McKinley, radar echoes from meteors, 2213
Millman, S., and A. T. Nordsieck, rising-sun magnetron, 909
—— with others, rising-sun magnetrons, 1553
Mills, B. Y., transient response of cathode followers, 2489
—— with others, 50-cm solar radiation during eclipse of 1st Nov. 1948, 3417
Milne, G., with B. O'Brien, motion picture photography at 10^7 frames/sec, 1514
Milner, C. J., and B. N. Watts, PbSe photocells, 2072
Milnes, A. G., magnetic amplifiers, (A)971, 2728
Milosevic, M., design principles for sound-deadened rooms, 2699
Milwright, A. L. P., improvement of radar echoes from buoys and small boats, 2803
Ming, Nai-Ta, networks with prescribed frequency dependence, 2-pole 3365, 4-pole, 3367
Minorsky, N., van der Pol oscillator, 988
Miquelis, H. E., climatization of electrolytic capacitors, 1967
Miselyuk, E. G., with V. E. Kosenko, AgS photocells, 1534
Mitchell, G., contrast expansion, (D)3086
Mitchell, H. T., and T. Kilvington, P.O.P.I. hyperbolic navigation aid, 95
—— T. Kilvington and W. E. Thomson, construction of zenithal-equidistant maps, 591
Mitchell, J. A., with G. A. Morton, performance of Type 931-A electron multiplier in scintillation counter, 1446
Mitchell, W. H., with J. H. Briggs, direct-reading fluxmeter, 1721
Mittelmann, E., oscillator performance analysis and automatic load compensation, (A)1612
Mix, D. H., push-pull transmitter for amateur bands, 555
Mobley, M. C., with others, F.C.C. diathermy unit, 2587
Möckli, A., Conferences of Union Internationale des Télécommunications, 3603
Mode, D. E., low-pass filters using coaxial transmission lines, 680
Moerel, P. G., and A. Rademakers, iron-free Cu wire for moving-coil galvanometers, 1908
Moffatt, V. J., with J. S. Brown, directive aerial for 152–162 Mc/s, 1869
Mohr, E., sound analysis with ultrasonic plate spectroscope, 2698
Moles, A., reverberation measurement with c.r.o., 1265
Möller, H. G., pulling of oscillations, 34; valve rectification and heterodyne reception, 2330
—— and A. Schoch, production of pressure pulses by cavitation, 2689
—— with W. Dieminger, magnetic triple splitting in ionosphere, 2791
Molloy, C. T., lined ducts as acoustic filters, 3014
Monk, N., and S. B. Wright, public telephone service in trains, 225
Montgomery, C. G., R. H. Dicke and E. M. Purcell, Principles of Microwave Circuits, (B)1636
—— with L. D. Smullin, Microwave Duplexers, (B)354
Moon, C., and G. M. Sparks, capacitance standards, 0.001–5 pF, 1439
Moore, A. R., with R. W. Engstrom, admittance of microwave switch Type 1B25, 3071
Moore, D. B., and W. N. English, point-to-plane impulse corona, 2499
Moore, R. C., transient-response tests on WPTZ television transmitter, (A)1810
Moore, R. S., with others, television camera tubes, (A)1810, 2924
Moral, J. J. H., slow-electron television cameras, 3270
Morcom, W. J., transmitters, Type TGM.651 and Type TGZ.651, 3289, Type TGM.571, 500-W m.f., 1219
Morgan, M. G., modulator producing 10^4 0.1-μs pulses/sec, 2188
Morgan, R. E., amplistat magnetic amplifier, 3352
Morgan, S. P., Jr, effect of surface roughness on eddy current losses, 2502
Morganstern, K. H., C. L. Cowan and A. L. Hughes, ethylene-filled G-M counters, 164
Morita, T., measurement of current and charge distributions on aerials, (A)1578
Morrical, K. C., J. L. Glaser and R. W. Benson, interactions between microphones, couplers and earphones, 2129
Morris, A. L., small power transformers for aircraft, 3849
Morris, L. P., compact mobile transceiver unit, 227
Morrison, R. F., noise in photocells, 897
Morrison, S. J., with others, 15-in. glass toroid for betatron, 471
Morrison, W. C., with others, multiple operation of u.h.f. transmitter valves, (A)1810, 2943
Morrow, C. T., calibration of vibration probes, 318
Morrow, E., with M. Disnal, band-pass circuit design for minimum d.f. bearing error, (A)1672
Morse, P. M., Vibration and Sound, (B)279, (B)1575
Mortensen, T., with J. Hartmann, methods of measuring sound-wave energy, 617
Morton, G. A., and J. A. Mitchell, performance of Type 931-A electron multiplier in scintillation counter, 1446
—— J. E. Ruedy and G. L. Krieger, image-brightness intensifier, 469
Morton, J. A., microwave triode Type BTL1553, 2964
Moskowitz, S., and D. D. Grieg, noise-suppression characteristics of p.t.m., 2314
—— and J. Racker, pulse generation, 2180
—— L. Diven and L. Feit, crosstalk in time-division multiplex systems, (A)1785
Moss, C. J., Araldite synthetic resin, 3450
Moss, H., c.r. tubes, high-power, 3308, for television, 2648
Moss, S. H., frequency analysis of modulated pulses, 835
Mostovetch, N., gas adsorption and electrical conductivity of thin metallic layers, 2786
Mott, N. F., semiconductors and rectifiers, (A)2814
Moullin, E. B., use of Bessel functions for calculating inductance of single-layer solenoids, 2157
Mouradoff-Fouquet, —, apparatus for accurate measurement of dielectric constant of liquids, 3190
Mouromtseff, I. E., review of valve development, 1538
Moxon, L. A., with others, direct-reading noise-factor meter, 794
Muckenhoupt, C. F., resonances in capacitors, 2161
Mueller, C. W., exposure of secondary-emission surfaces to evaporation from oxide cathodes, (A)1824
—— with E. W. Herold, beam-deflection mixer valve for u.h.f., 2383
Mugridge, A. H., with others, errors in h.f. d.f. bearings due to masts, 1074
Mukerjee, G. C., with S. S. Banerjee, fading of s.w. signals, and space-diversity reception, 823
Mulders, C. E., ultrasonic absorption measurements, in liquids, 932, in water at 1 Mc/s, 3322
Mullaney, J. F., F. Reines and H. G. Weiss, excitation time of ZnS·Ag phosphor, 106
Muller, F. A., with H. den Hartog, noise reduction in thermionic electrometers, 1387
—— with others, self-quenching G-M counters, 1139
Muller, J. T., high-impact shock tests, 1440
Müller-Strobel, J., radiation impedance and aerial shortening of transmitter dipole, 1598
—— and J. Patry, transmitter dipole, 3055
Mullett, L. B., and B. G. Loach, corrugated waveguides for linear electron accelerators, 175
—— with others, travelling-wave linear accelerator for 4-MeV electrons, 1148
Mulligan, J. H., Jr, transient response of linear systems, 2165
Mulvey, T., and L. Jacob, distortion-free e.s. lenses, 2292
Mumford, W. W., directional couplers, (C)2434; maximally flat filters in waveguide, 1320
Munday, G. L., with others, mechanism of emission from oxide cathodes, 253
Munro, E. H., tables and graphs of sunspot frequency, 1749–1948, 699
Munro, G. H., short-period variations in ionosphere, 1664, 2517
Murakami, T., and M. S. Corrington, amplitude and phase relations in networks, 1812
Mural, F., aerial distribution system for laboratory, 1116
Murdock, C. E., television interference reduction, 3286
Murphy, J. L., with J. N. Van Scoyoc, high-*Q* variable reactance, 1010
Murphy, T., with others, high-sensitivity remanent magnetometer, 3469; pre-history of earth's magnetic field, 1045
Musson-Genon, R., graphical methods for electron trajectories, 688
Mustel', E. R., with P. E. Krasnushkin, radiation of oscillations from cavity resonator through aperture, 1329
Myakishev, G. Ya., electron-beam h.f. oscillators, 667
Myers, H. P., with others, structure and properties of alloy Cu_2MnIn, 1956

N

Naday, G., noise measurement for u.h.f. receivers, 2833
Nadler, M., network synthesis for given transient conditions, 2461
Nagy, E., $ZnSiO_3$ phosphors, 1951
Naismith, R., radio detection of meteors and sporadic-E effects, 1364
Nai-Ta Ming. See Ming, Nai-Ta.
Nash, W. F., with others, spectrum of X rays from 20-MeV betatron, 180
Naslin, M., servomechanisms, 858
Naslin, P., piezoelectric dynamometer, 161
—— and A. Peuteman, electronic-counter chronometer, 3357; electronic counters for impulses, 660, 2740
Nasse, G., properties of general symmetrical mesh network, 979
National Bureau of Standards, Ionospheric Radio Propagation, (B)824; Tables of Bessel Functions of Fractional Order: Vol. 1, (B)1930
National Defense Research Committee, Radio Wave Propagation, (B)3528
National Research Council of Canada, The War History of the Radio Branch, (B)3153
Nature, electronics in research and industry, 1740; giant sunspot and geomagnetic storm, 1654; radiolocation of thunderstorms, 1676; Royal Society discussion on calculating machines, (AD)128; television in Britain, 891
Naumann, H., maintenance of constant magnetic field, 1720
Naumann, O., determination of transmission constants of cables, 1999
Nawijn, A., mechanism of G-M counters, 1137
Necnlebe, F., penetration of alternating magnetic field into solid iron, 3411
Néel, L., magnetic properties of ferrites: ferrimagnetism and antiferromagnetism, 3159; theory of ferromagnetism, 2782; theory of magnetic properties of $Fe_2O_3\alpha$, 3161
Neelands, L. J., and W. Hausz, telemetry for guided missiles, 425
Neill, T. R., plasma-electron oscillations, 1644
Neiman, M. S., cathode-grid space of u.h.f. valve oscillators, 1237
Nelson, E. H., quartz/metal seal, 1420
Nelson, R. C., recording spectra for λ 1.2–3 μ with PbS photoconductive cell, 2908
—— and W. R. Wilson, infra-red recording spectrometer, 459
Neovius, G., filter design by frequency transformations, 1317
Nergaard, L. S., double-beam growing-wave valve, 1540
Nethercot, W., car-ignition interference, 3248
—— and S. F. Pearce, ignition interference, 2937
de Neuf, D. K., Rural Radio Network, 839, transmitters for, 561
Neumann, R., Patent Office library, 1561
Newall, F. G., and J. G. Spencer, phase discriminator for f.m. reception, 1001
Newbery, G. R., microwave linear electron accelerator, 3225
Newbound, R., with F. Widnall, protective finishing of electrical equipment, (D)1094
Newhouse, R. C., Type 248A marine R/T equipment, 229
Newman, M. H. A., design of all-purpose computing machines, 1425
Newman, M. M., corona interference with reception in aircraft, 2621
—— R. P. Featherstone and P. S. Christaldi, c.r.o. with 100 Mc/s bandwidth, (A)2568
Newstead, G., and D. E. H. Gibbings, transients in low-pass filters, 3081
Newton, C. C., with others, interaction of radio waves in the ionosphere, 194
Newton, H. W., geomagnetic storms and solar activity, in 1947, 82, 1036, in 1948, 1923; relation between sunspots and geomagnetic storms, (A)1370, 1924
Newton, R. H. C., with R. O. Jenkins, free Ba and the oxide cathode, 2957
Newton, R. R., space-charge effects in bombardment conductivity of diamond, 1648
New Zealand Post Office, solar radio noise between 6.7 and 25.0 Mc/s, 2510
Nguyen, Thien-Chi, powder metallurgy, 2817
Nichols, M. H., with C. Herring, thermionic emission, 3407
Nichols, N. B., with others, Theory of Servomechanisms, (B)232
Nicholson, S. B., solar and magnetic data, Mount Wilson, Oct.–Dec. 1947, 371
Nickerson, M., with others, pulse generator for medical applications, 3097
Nicoll, F. H., temperature dependence of emission bands of ZnO phosphors, 783

le, J. D., with H. M. Zeidler, pentriode video amplifiers, [illegible]
Nielsen, K., with F. Ingerslev, work of Technical Acoustics Laboratory, Copenhagen, 3324
Niessen, K. F., cavity resonators, avoiding low frequencies in, 1330, frequency stability of, 992, 993, perturbed, nodal planes in, 994, 3092, spherical, frequency constancy of, 987; ground-absorption formula for vertical dipoles, (C)949; landing courses independent of weather conditions, 102, 1081; relaxation in anomalous skin effect, (D)3403
Nijenhuis, W., transients in finite homogeneous ladder networks, 965
Nikonov, G. I., 2-terminal networks with nonlinear resistances, 2464
Nilsson, B., with H. Werthén, automatic impedance meter, 1723
Nims, P. T., with O. E. Bowlus, parallel operation of aircraft alternators with electronic frequency changers, 655
Nitsche, H., design of dust-core h.f. coils, 2736
Niutta, A., commercial long-distance radio-communication, 3252
Nixon, G. M., planning radio and television studios, 1795
Noble, D. E., adjacent-channel operation of mobile equipment, 2914
Nolle, A. W., logarithmic-scale voltage measurement, 439; modulation of ultrasonic waves in liquids by e.s. field, 3321
Nonnekens, J. C., design of m.f. broadcasting aerial arrays, 1605
Nordsieck, A. T., with S. Millman, rising-sun magnetron, 909
Noriega, L. R., reflection at dielectric in waveguide, 3038
Norinder, H., propagation of atmospherics, 1389
—— and O. Karsten, resistance and power in artificial-lightning paths, 2788
—— and G. Petropoulos, impulse characteristics of ground under direct discharges, 723
Norton, F. R., input circuits for television receivers, 510
—— C. G. McMullen and G. L. Haugen, train television, 1814
Norton, L. E., microwave power measurement, 3195
Nuovo, M., aperiodic frequency doubler, 1335
Nylund, H. W., with W. C. Babcock, aerials for multichannel mobile telephony, (A)1578

O

Oakes, W. G., electric strength of synthetic polymers, 1695
Oatley, C. W., with others, plotting of electron trajectories, 1751
Oboril, F., and K. Rawer, F_2-layer longitude effect and m.u.f. forecasting, 2794
O'Brien, B., and G. Milne, motion picture photography at 10^7 frames/sec, 1514
O'Brien, E. J., high-fidelity reproduction from gramophone pickups, 1574
O'Brien, R. S., edispot for magnetic-tape editing, 12
Obukhov, A. M., structure of temperature field in turbulent air stream, 1928
Ochmann, W., infra-red location with PbS cells, 1731
Ockenden, C. V., location of atmospherics, 1056
O'Dea, D., magnetic recording, 943
Odynets, L. L., measuring dielectric constant and loss of solids at cm λ, 1989
Oetjen, G. W., vacuum technique, 1403
Okress, E. C., magnetron resonator system, 1555
Ol', A. I., geomagnetic disturbances and solar activity, 1369; 22-year sunspot cycle, 1372
Ol'derogge, G. B., superregenerator in nonlinear mode for f.m. reception, 1483
Oliner, A. A., slow waves in cylindrical waveguides, 292, (D)641
Olink, J. T., with others, a.c. galvanometer, 3199
Oliphant, W. D., e.m. horn, 3042
Oliver, B. M., efficient sweep circuit, (A)1612
—— J. R. Pierce and C. E. Shannon, p.c.m., 843
Oliver, D. A., and D. Hadfield, magnetic materials, 1417
Olsen, J., solar-diurnal variation in terrestrial magnetism, 711
Olson, H. F., reproduction of sound, (A)1563
—— and J. Preston, single-element unidirectional microphone, 1854; valve gramophone pickup, 616
Oñativia, R. A., high-emission cathodes, 1231
O'Neill, J. D., with others, television propagation survey for New York metropolitan area, 2353
Oosterkamp, W. J., with J. van Hengel, direct-reading dynamic electrometer, 2845
Opechowski, W., e.m. waves in waveguides, 296, 297
Ordung, P. F., with H. L. Krauss, distortion and bandwidth characteristics of p.m., 846
—— with others, synthesis of RC lattice structure, (A)1612
Orlowski, A., with A. Coudert, television aerials, 955, 956
Ortusi, J., propagation and applications of H_0 waves, 2141
—— and P. Fechner, geometrical representation of characteristics of active obstacle in waveguide, 2140
—— with H. Gutton, wide-band modulation with magnetron, (A)894
Osborn, J. A., magnetostriction generators, 1802
Osterheld, W., with M. Slurzberg, Essentials of Radio, (B)272
Osterland, E., with F. H. Shepard, Jr, peak-to-peak voltmeter, 440
Ostlund, E. M., and G. S. Wright, f.m. broadcasting in U.S.A., 1512
Ostrovidow, S., aircraft-landing cable, 2805
Oswald, J., properties of signals with limited spectra, 3069
—— with H. Gardère, crosstalk in multiplex pulse systems, 224
Ott, H., reflection of spherical waves, 3117
van Overbeek, A. J. W. M., with J. L. H. Jonker, control of electron beam by intersecting beam, 3294
Overton, I. R. A., with W. A. Penton, water-flow wattmeter for cm λ, 447
Owen, H. M., with C. R. Maduell, Jr, carrier-type d.c. amplifier, 3385
Owen, J. C., automatic pilots, 1680
Oxford, A. J., pulse communication, (D)1184

P

Packard, D., with N. B. Schrock, pulse-counter type f.m. station monitor, 449
Padel, S. H., delay distortion in television transmission, 1521
Padgett, E. D., design and performance of electrets, 1879
Padurow, N. N., Etch and Percussion Figures, and Twinning of Quartz, (B)2818
Page, C. H., digital-computer switching circuits, 418
Page, H., ring-aerial systems, 308, (C)1296
—— and G. G. Gouriet, ignition interference with f.m. transmissions at 45 and 90 Mc/s, 506
Pakswer, S., PbS photoconductive cells, 2370, (C)3299
—— with N. Anderson, comparison of PbS photoconductive cells with photoemissive cells, 1537
Palluel, P., with others, travelling-wave valves as wide-band oscillators, 1830
Palmer, R., IBM Type 604 electronic calculator, (A)1703
Palmer, R. C., precision timing-marker generator, (A)1713
—— and L. Mautner, video amplifier transient response, 3395
Panetti, M., electron motion in cavity magnetron, 1557
Pannenborg, A. E., properties of ground aerials, 962
Panter, P. F., and W. Dite, distortion in pulse-count-modulation system, (A)1785; negative feedback in f.m. systems, 3548
—— with others, distortion in pulse-count modulation, 768; effect of limiters on a.m./f.m. wave, 1505; improvement of signal/noise ratio in p.c.m. system, 2325
Paola, N. J., C. P. Boyce and I. C. Ramsay, 12-channel carrier telephone systems in South Africa, 3539
Papas, C. H., infinitely long cylindrical aerial, 2715
—— and R. King, surface currents on conducting sphere excited by dipole, 1592
Papp, G., pulse period of electron multiplier tubes, 1152
—— with Z. Bay, coincidence circuit with high resolving power, 974
Pardue, T. E., with others, determination of elastic constants for β-quartz, 738
Paris, P., and J. Polonsky, 1-kW m.f. broadcasting transmitter, 1529
Parkash, O., with H. R. Sarna, magnetic storms and cosmic-ray intensity, 3420
Parker, E., and L. S. Le Page, operational factors for marine radar, 2803
—— and P. R. Wallis, 3-dimensional c.r.o. displays, 577, (D)3307
Parker, M. J., peak-selector circuit, (A)1612
Parkin, P. H., concert-hall acoustics, (AD)2124
Parkinson, W. D., atmospheric conductivity at Huancayo, 721
Parrack, H. O., with D. H. Eldredge, biological effects of intense sound, (A)[illegible]
Parratt, L. G., with others, airborne magnetometers, 815
Parrish, W., and E. Cisney, X-ray diffraction camera, 1752
Parry, C. A., design of precision capacitance bridge, 2847
Parsons, J. H., electronic classifying, cataloguing and counting systems, 2290
Parsons, S. J., with others, solar radiation, 1368
Partington, J. R., G. V. Planer and I. I. Boswell, dielectric properties of titanates, 1970
Partridge, G. R., voltage/current relation for power triodes, 1833
Pascucci, A. A., applications of 4-terminal titanate capacitor, (A)1612
—— and H. Wolf-Stawski, ceramics with high dielectric constant, 1413
Pashler, P. E., with others, radio investigations of shell flight, 186
Päsler, M., distortion formula in closed form, 1303; reproducibility of properties of oscillatory systems, 2472; forced oscillations, resonance curves for, 1620, transient effects with, 1324
Patry, J., with J. Müller-Strobel, transmitter dipole, 3055
Patton, P. B., v.h.f. railroad radio link, 226
Pautin, N. V., with others, electronic frequency regulator, 2335
Payne, R. M., with others, spectrum of X rays from 20-MeV betatron, 180
Payne-Scott, R., and L. L. McCready, ionospheric effects during dawn solar-noise observations, 1033
Pearce, A. F., v.m. oscillator for λ 3.2 cm, 339
Pearce, S. F., with W. Nethercot, ignition interference, 2937
Pearse, R. W. B., spectrum of night sky, 1386
Pearson, G. L., physics of electronic semiconductors, 740
Pearson, H. A., R. W. Carlisle and H. Cravis, vibrators for measuring pickup response, 775
Pease, M. C., Q measurements for 2- and 4- terminal networks, 2266
Peat, J. D., personal errors in d.f., 91
—— with S. A. W. Jolliffe, panoramic reception, 1770
Pech, H., L.T.T. 12-channel carrier-current system for overhead lines, 2046
Pedersen, A., spark breakdown voltage in air, 3122
Peierls, R. E., and T. H. R. Skyrme, electrolyte tank and magnetic problems of axial symmetry, 1988
Pekeris, C. L., effect of ground constants on microwave propagation, 822
—— and W. S. Ament, microwave propagation in refracting atmosphere, 479
Pekeris, C. L., and M. E. Davis, microwave transmissions at San Diego under duct conditions, 2610
Pelletier, M., with others, biological effects of microwaves, 2283
Pelzer, H., with D. W. Bird, crystallite size and electric strength of polythene, 1696
Pemberton, J. C., with C. E. Berry, 12-equation computer for linear equations, 1978
Pemberton, M. E., with W. L. Watton, direct-capacitance aircraft altimeter, (A)1126, 2848
Penick, D. B., with others, carrier system with 8-kc/s bandwidth, 2905
Penndorf, R., O_3 content of middle stratosphere, (A)714; vertical distribution of atomic oxygen in upper atmosphere, 2224
Pennell, E. S., with J. P. Griffin, EDT crystals, 2529
Penrose, H. E., Principles and Practice of Radar, (B)3150
Pensak, L., graphechon television picture-storage tube, (A)1810, 2061, [illegible]
Penton, W. A., and I. R. A. Overton, water-flow wattmeter for cm λ, 447
Pérez, A., current fluctuations in plane diode, 2673
Perlick, P., breakdown of solid insulating materials, 1100
Perry, F. R., with J. M. Meek, lightning, 1391
Perry, H. A., with others, conductive plastic materials, (A)1681
Person, S. V., M. A. Sobolev and N. I. Eydlin, design of high-power modulation transformers, 968
Peter, R., Breitband-Richtstrahlantennen mit Anpassvierpolen für Ultrakurzwellen, (B)2722
Peterson, A. M., with others, Doppler investigation of meteors, 2801
Peterson, A. P. G., nonlinear distortion measurement, (A)1713
Peterson, L. C., equivalent circuits of linear active quadripoles, 1315
—— with W. R. Bennett, e.s. field in triodes, 2961
Peterson, T. A., Jr, with L. A. Rosenthal, measurement of series-resonant resistance of quartz crystals, 3202
Petrie, W., P. A. Forsyth and E. McConechy, auroral displays at Saskatoon, Jan./Feb. 1949, 2522
—— with others, auroral 3000-Mc/s radiation, 3139
Petropoulos, G., with H. Norinder, impulse characteristics of ground under direct discharges, 723
Petrzílka, V., with R. Bechmann, length oscillations of crystal rods, 2777
Pettit, J. M., with F. J. Kamphoefner, low-power wide-tuning-range u.h.f. oscillators, (A)1612
—— with D. L. Trautman, Jr, amplifier synthesis by means of conformal transformations, (A)1612
Peuteman, A., with P. Naslin, electronic-counter chronometer, 3357; electronic counters for impulses, 660, 2740
Pfister, A. C., precision carbon resistors, 317
Pfriem, H., theory of steep-fronted plane pressure-waves, 2684
Phelizon, G., with R. Cabessa, u.h.f. standard receiver and generator, 792
Philippe, C., fault location on l.v. cables, 281
Phillips, E. N., W. G. Sterns and N. J. Gamara, High Frequency Measuring Techniques using Transmission Lines, (B)2866
Phillips, F. C. F., direct-reading frequency meter, 156, 1129
Phillips, F. M., inductance of screened single-layer solenoids, 2158
Phillips, G. J., with others, performance of multi-aerial Adcock d.f. systems, 1061
Phillips, J. W., with others, solar radiation, 1368
Phillips, M. L., f^oF_2 and sunspot numbers, 391
Phillips, R. S., with others, Theory of Servomechanisms, (B)232
Pickard, G. W., and H. T. Stetson, tropospheric effects on ionospheric propagation, 2611
—— with H. T. Stetson, WWV field-intensity measurements, 491
Pickard, R. J., with G. N. Davison, multichannel radiotelegraph equipment, 333
Pickles, S., characteristics of 330-Mc/s glide-path systems, (A)1672
Pièce, R., Sottens 100-kW broadcasting transmitter, 1821
Pierce, E. T., with T. W. Wormell, atmospherics, (A)395
Pierce, J. A., A. A. McKenzie and R. H. Woodward, Loran : Long Range Navigation, (B)106
Pierce, J. R., double-stream amplifiers, (A)1612, 3387; fluctuations in electron streams due to ions, 689; paralleled-resonator filters, 1619; travelling-wave valves, circuits for, 2382, transverse fields in, 1543
—— and W. B. Hebenstreit, theory of v.h.f. amplifier with double-stream electron flow, 2486
—— and N. Wax, filter-type travelling-wave amplifiers, 2668
—— with others, p.c.m., 843
Pierry, G., thermistors, 3068
Pietermaat, F. P., circuits with e.m. coupling and application in h.f. induction heating, 2174
Piggott, W. R., A Method of Determining the Polar Diagrams of Long Wire and Horizontal Rhombic Aerials, (B)1300
—— with others, anomalous effects in ionospheric absorption, 192
Pike, W. S., with others, letter-reading machine for blind, 2593, 2877
Piloty, H., reactance quadripole with given blocking points, 3366
Pim, J. A., breakdown strength of air at u.h.f., 2246
Pinciroli, A., c.r.o. with cylindrical screen, 1551
—— and R. Ferrero, equivalent circuit and input admittance of retarding-field valve, 1311
—— and A. Taraboletti, matrix analysis of linear active networks, 2744
Pinkerton, J. M. M., pulse method of measuring ultrasonic absorption in liquids, [illegible]
Pippard, A. B., h.f. resistance of superconducting Sn, 69; h.f. skin effect at low temperatures, (A)360
Pitman, D., c.r. tube chronoscope and counter, 1111
Pitsch, H., Lehrbuch der Funkempfangstechnik, (B)2904
Pittman, R. W., with D. J. G. Ives, amplifier for use with conductance bridges, 1907
Pitts, W. J., with others, naval h.f. c.r. direction finder, 1064
ver Planck, D. W., M. Fishman and D. C. Beaumariage, analysis of magnetic amplifiers, with feedback, (A)2443, 3064, without feedback, (A)2447, 3351
Planer, F. E., cable fault finder, 3189
Planer, G. V., with others, dielectric properties of titanates, 1970
Pleijel, H., theory of filter networks, 1422, (C)1976
Plessner, K. W., with E. Billig, efficiency of Se photocells, 2371
Pliner, Yu. G., magnetic field of rotating bodies, 1374
Plowman, J. C., amplifier for 100 c/s to 20 Mc/s, 3103
Pohl, R. V., with C. W. Clapp, X-ray thickness gauge, [illegible]
Pohlman, R., with W. Janovsky, generation of ultrasonic waves in liquids for industrial purposes, 1442
van der Pol, B., mathematics and radio problems, 1106
Polgreen, G. R., magnetic materials, 1417
Poll, J. A., with others, quartz-crystal chronometer, 1112
Pollard, E., with H. L. Schultz, coincidence circuit with medium resolution, [illegible]
Pollard, E. C., and J. M. Sturtevant, Microwaves and Radar Electronics, (B)3152
Pollard, L. G., Western Union teletape facsimile, 2647
Pollock, H. C., with others, 70-MeV synchrotron, 2594
Polonsky, J., with P. Paris, 1-kW m.f. broadcasting transmitter, 1529
Ponomarev, M. L., formula for current in receiving aerial, 2298
Poole, M. J., automatic current integrator, 2455
Pope, T. J., with others, fitting and use of marine radar, 2803
Popham, T. S., transit time effects in output fields, 911
Popper, P., and G. White, bridge-type valve voltmeters, 1435
Portier, H., consol radio beacons, 2237; loran, 3434
Portmann, P. A., impedance measurement for microwave transmission lines, (A)1713
Post, E. J., equivalent circuit of Curie double strip, 990
Post, R. F., with W. W. Hansen, measurement of cavity impedance, 1719
Potapenko, I. R., AgS photocells, 1535
Powell, H., with others, industrial infra-red spectrometer, 3494
Powell, W. M., and others, e.m. deflector for beam of 184-in. cyclotron, 472
Power, D. W., with G. M. Rose, pencil-type u.h.f. triode, (A)1824
Powles, J. G., dielectric properties, of $BaTiO_3/SrTiO_3$ mixtures at 10 kMc/s, 1093, of titanates at u.h.f., 1092
Prache, P. M., impedances in the feedback amplifier, (D)1012
Prakke, F., with G. Alma, rimlock miniature valves, 2080
Pratt, T. H., infra-red image-converter tube, 796
Preist, D. H., annular circuits for high-power multiple-valve generators, (A)1612
Pressey, B. G., h.f. transmitter for determining d.f. polarization error, 1941; rotating H-Adcock direction finder, 2234
—— and G. E. Ashwell, radiation from car ignition systems, 1779
Preston, J., with H. F. Olson, single-element unidirectional microphone, 1854; valve gramophone pickup, 616
Prévost, J., J. Boissière and A. Loukovski, forced-air cooling of transmitting valves, 2377
Price, A. T., with A. A. Ashour, induction of electric currents in non-uniform ionosphere, 1049
Price, L. D., radar as aid to ferries, 2803
Prichard, J. S., and A. H. Mankin, aerial polar diagrams for aircraft in flight, (A)307
Prigent, J., UO_2 thermistors, 2250
Procopiu, S., magnetic field of rotating mass, 704
Prowse, W. A., and W. Jasiński, c.r.o. obervations on u.h.f. sparks, 1643
—— with R. Cooper, h.f. breakdown phenomena in gases, (A)361
Pruzhinina-Granovskaya, V. I., nonlinearity of V/A characteristic of carborundum, 1962
Puckle, O. S., experience with marine radar, 2803
Pugsley, D. W., post-war television receiver design, 885
Pullen, K. A., circuit design using G-curves, 1612
Pulling, M. J. L., B.B.C. sound-recording methods, 11
Pumper, E. Ya., electrical fluctuations in conductors, 1362
Pumphrey, R. J., with T. Gold, cochlea as frequency analyser, 1259
Pungs, L., and K. Lamberts, modulation and keying, 2361
Purcell, E. M., with others, Principles of Microwave Circuits, (B)1636
Putley, E. H., electrical conductivity of Ge, 2811
Putman, J. L., and E. H. Cooke-Yarborough, measurement of dead-time in G-M counters, 1445

Q

Quantie, Chow, See Chow, Quantie
de Queiroz Orsini, L., flicker effect in saturated diodes, 2958
de Quevedo, J. L. G., and W. V. Smith, frequency stabilization of microwave oscillators by spectrum lines, 1608
Quinn, D., and R. D. Holland, homing beacons for naval aircraft, 99
—— and L. S. LePage, monitoring of homing and blind-approach equipment, 159
Quynn, J. T., adjustable aperture for R.C.A. Type EMU electron microscope, 184

R

Racker, J., with S. Moskowitz, pulse generation, 2180
Rademakers, A., capacitor microphone for stereophony, 10
—— with P. G. Moerel, iron-free Cu wire for moving-coil galvanometers, [illegible]
Radley, W. G., speech intelligibility in deafness or loud noise, (D)1261
Rado, G. T., with M. H. Johnson, ferromagnetism at v.h.f., 1994
Rae, C. C., frequency-shift receiving system for naval facsimile circuits, (A)1785
Ragan, G. L., Microwave Transmission Circuits, (B)1016
Ragazzini, J. R., and L. A. Zadeh, wide-band a.f. phase meter, (A)1713
Raithel, K., with K. Frank, high-resistance PbS layers, 3296
Rajeswari, —, with S. K. Chatterjee, dielectric constants of insulators at u.h.f., 118
Rakshit, H., and N. Sarkar, wide-band f.m., 2362
Ramberg, E. G., aberration correction with electron mirrors, 2019; phase contrast in electron-microscope images, 2881
—— and J. Hillier, chromatic aberration and resolving power in electron microscopy, 1453
—— with V. K. Zworykin, Photoelectricity and its Applications, (B)[illegible]
Ramberg, W., acceleration measurement with valve, 813
Ramsay, B. P., with V. A. Brown, Maxwell bridge at low frequencies, 2849
Ramsay, H. T., grid current in multivibrators with RC coupling, 1902
Ramsay, I. C., with others, 12-channel carrier telephone systems in South Africa, 3539
Ramsden, W., with others, ZnS phosphors, (C)1404
Rand, P. S., television interference reduction, [illegible]; 10-m amateur transmitter, 1530
Randall, J. T., cavity magnetron, 1554
—— with H. A. H. Boot, cavity magnetron, (D)3309
Randals, A. W., with J. F. Hull, high-power interdigital magnetron, 908
Rao, N. S. Subba, and Y. V. Somayajulu, rapid fading in m-λ broadcast reception in India, 2085
Ratcliffe, J. A., diffraction from ionosphere and radio-signal fading, 193; interaction of radio waves, (A)[illegible]; ionosphere and e.m. wave propagation, 3522
Rawcliffe, G. H., spiral timebase, 2758
Rawer, K., measurement of sporadic-E ionization, 2226; r.f. variations due to F-layer height variations, 1163
—— with F. Oboril, F_2-layer longitude effect and m.u.f. forecasting, 2794
Rawson, H., stresses in glass/metal tube seals, 1419
Ray, G. W., low-cost television operation at New Haven, 2351
Raymond, R. C., and W. Webb, radiation resistance of loaded aerials, 2438
—— with W. Webb, current distributions on simple aerials, [illegible]
Read, O., recording and reproduction of sound, 632
—— and R. Endall, recording and reproduction of sound, [illegible]
Reber, G., cosmic noise, 377, 2215
Recknagel, A., with H. Mahl, aperture errors of e.s. electron lenses, [illegible]
Reddeck, J. G., with others, multiple operation of u.h.f. transmitter valves, (A)1810, 2943
Reddish, W., cyclic variations of capacitance of titanate-ceramic capacitors, 322
Redgment, P. G., radio aids to marine navigation, 98
—— and D. W. Watson, very-long-wave phase differences between spaced aerials, 195
—— W. Struszynski and G. J. Phillips, performance of multi-aerial Adcock d.f. systems, 1061
—— with R. V. Whelpton, c.w. long-range navigation aids, (D)[illegible]
—— with others, aerial systems for h.f. d.f. in ships, 1075
Redheffer, R. M., microwave aerials and dielectric surfaces, 2436
Redshaw, S. C., electrical potential analyser, 1707
Reed, R. R., 3-cm resonant cavity for frequency reference, 1331
Regenstreif, E., with F. Bertein, asymmetry of e.s. lenses, 2879

Reich, H., and K. Gund, beam extraction for centrifugal electron-accelerators, [illegible]
Reich, H. J., mode separation in oscillators, **327**
Reiche, H., atmospheric noise measurement, **2276**
Reichel, W., present-day television standards in U.S.A., **3566**
Reiffel, L., thyratron square-wave generator, **2759**
Reines, F., with others, excitation time of ZnS-Ag phosphor, **108**
Reiskind, H. L., with others, record changer and complementary record, **2711**
Reiss, A., with R. V. Alred, logarithmic anti-clutter radar receiver, **1172**
Remillon, R., test methods for v.h.f. and u.h.f. valves, **3489**
Renne, V. T., paper capacitors impregnated with semiconducting liquids, **1969**
Renouard, M., h.f. induction heating, **465**
Rentzel, D. W., omnirange aerial navigation and control system, **3149, 3433**
Rettie, R. S., omnidirectional, vertically polarized 4-element aerial array, **952**
Reusse, W., application of dm and cm waves in medicine, **1742**
Reuter, G. E. H., and E. H. Sondheimer, theory of anomalous skin effect in metals, **1354**
Rex, H. B., bibliography on transductors and magnetic amplifiers, **2451**; transductor, **2450**
Reynolds, D. K., with M. B. Adams, converters for u.h.f. television reception, **3568**
Reynolds, G. D., tests for selecting components for broadcast receivers, **(D)453**, [illegible]
Rezelman, J., axial field and losses of inductance coils without iron, **1876**
Rhodes, D. R., flush-mounted aerial for cars, **1594**; radiation patterns of horn aerials, **23**
Ribaud, G., h.f. induction heating of substances of low conductivity, **3505**
Riblet, H. J., swept-frequency 3-cm impedance indicator, **1120**
—— and C. B. Barker, reflection of e.m. waves from curved surface, [illegible]
Rice, S. O., rectangular waveguides, reflection at corners in, **2428**, reflections in, differential equations for, **2427**
Rich, S. R., and A. H. Rosen, sonic hyperbolic navigation system for harbours, **626**
Richards, P. I., general impedance-function theory, **1882**
Richardson, E. G., sound, **1251, 1252**
Richardson, J. M., and B. T. Matthias, theory of dielectric behaviour of BaTiO$_3$, **745**
—— with others, dielectric behaviour of BaTiO$_3$, **746**
Richman, D., optimum selectivity in superregenerators, **2613**
—— with others, superregenerator design, **499**
Richter, H., Elektrische Kippschwingungen, **(B)2773**
Rideout, V. C., wide-band frequency discriminator design, **2483**
Ridgway, J. F., with D. G. Tucker, synchrodyne receiver, **3533**
Ridings, G. H., facsimile transceiver for telegrams, **3558**
Ridler, D. S., with others, use of gas-filled tubes for number storage and sending, **2322**
Riebman, L., theory of superregenerative amplifier, **1627, (C)2488**
Riethmuller, J., with F. Violet, oxide cathodes, **2956**
Rifenbergh, C. M., D. S. Schover and E. H. Schulz, magnetostriction torquemeter, **463**
Rigby, H. A., and C. W. Bunn, change of volume of polytetrafluoroethylene at 20°C, **3449**
Rigterink, M. D., with others, attenuator materials for microwaves, **1691, 2535**
Rinehart, R. F., rapid scanning for radar aerials, **1593**
Rinia, H., and P. M. van Alphen, correction plates for Schmidt optical systems, **63**
—— J. de Gier and P. M. van Alphen, home projection television, **3275**
—— D. Kleis and M. van Tol, high-speed facsimile equipment, **2338**
—— with P. M. van Alphen, projection-television receiver optical system, **1215**
Risch, R., molecular vacuum pumps, **3154**
Rivère, P., multiplex R/T link from Corsica to mainland, **214, (C)1502**
Robb, A. C., with E. W. Marchant, testing of small servomechanisms and data-transmission systems, **2329**
Roberts, A., portable G-M counters for drill holes, **3498**
Roberts, F. F., measurement of impedance irregularities in h.f. coaxial cables, **1724**
Roberts, H. C., with H. W. Katz, servomechanisms for control of testing machine, **530**
Roberts, W. A., stable LC oscillator, **(D)328**
Roberts, W. G., ceramic capacitors, **2162**
Roberts, W. K., with others, F.C.C. diathermy unit, **2587**
Robertson, S. D., phase measurement for microwaves, **2560**
Robillard, J., use of electron microscope in optical industry, **2598**
Robinson, C., design of synchrotron pole faces, **3509**
Robinson, F. E., development of new materials, **3166**
Robinson, I. R., magnetic and inductive non-destructive testing of metals, **2245**
Robinson, J. D. M., international auto-telegraph networks, **210**
Robinson, L. B., Laplace transform and solution of linear integral equations, **757**
Robus, E. G., with others, measurement of resonance frequency of re-radiating structures, **1132**
Rocard, Y., solar radiation on 158 Mc/s, **2214**
—— and J. L. Steinberg, r.f. noise from thunderclouds, **2797**
Rochester, N., with D. R. Brown, rectifier networks for multi-position switches, **1609**
Rocke, A. F. L., with others, naval h.f. c.r. direction finder, **1064**
Rockwell, R. J., broad-band high-level modulator, **246**
Rod, R. L., radar p.p.i. calibrator, **2277**
Rodda, S., photoelectric multipliers, **2074**
Roddam, T., elementary communication theory, **2320**; frequency-shift keying, **841**
Rodhe, S., voice-frequency telegraphy, **208**
Roe, D., magnetic-recording technique, **3329**
Roeschen, E., absolute field-strength measurement, **1987**; measurements on frame aerials, **2441**; production of uniform h.f. field, **1430, 2784**
Roetken, A. A., with others, broad-band microwave relay system, New York/Boston, **1793**
Roger, M., fault finding in underground cables, **288**
Rogers, D. C., travelling-wave amplifier for microwave link, **3584**
Rogers, T. F., propagation conditions in transitional microwave range, **(A)1757**
—— with J. V. Harrington, improvement of signal/noise ratio by integration in storage tube, **(A)1769**
Rogozinski, A., with others, construction of metal G-M counters, **2871**
Rohde, L., and R. Leonhardt, telesynchronization with standard frequency, **2071**
Rohrmann, A., temperature-compensated metal-cylinder capacitors, **1880**
Romanet, A., power supplies at amplification centres of long-distance telephony systems, **1496**
Romnes, H. I., R/T in America, **1503**
van Roosbroeck, W., carbon resistors for h.f., **318**
Roosenstein, H. O., receiving aerials for television, **2718**
de Rosa, L. A., design in nature as exploited by the communication engineer, **(A)1769**
Rose, G. M., and D. W. Power, pencil-type u.h.f. triode, **(A)1824**
Rosen, A., impedance of composite conductors, **3060**
Rosen, A. H., with S. R. Rich, sonic hyperbolic navigation system for harbours, **626**
Rosen, S., and J. T. Bangert, theory of waveguide directional couplers, **2169**
Rosenthal, L. A., and T. A. Peterson, Jr, measurement of series-resonance resistance of quartz crystals, **3202**
Rosinski, W., with R. M. Griffith, naval v.h.f. d.f., **1060**
Roske, E., temperature compensation of oscillatory circuits, **2754**
Ross, G. L., with R. A. Rowden, effect of reflections from aircraft on 45-Mc/s reception, **1486**
Ross, H. A., Australian f.m. mobile communication equipment, **1191**
Ross, H. D., with others, multiplex transmission through waveguides, **300**
Ross, I. M., war-time development of components, **(D)353**
Ross, W., d.f., **(D)1066**; polarization errors in Adcock direction finders, **3143**; probable accuracy of h.f. d.f. bearings, **1068**
—— and E. N. Bramley, tilts in the ionosphere, **3424**
Rostagni, A., and I. Filosofo, radiometer vacuum gauge, **2240**
Roston, B., a.f. mine detectors, **1156**
Roth, W., piezoelectric transducers, **3021**
Rouch, J., atmospheric e.s. field during solar eclipse, **2521**
Rounds, P. W., with C. H. Dagnall, delay equalization of carrier circuits with 8-kc/s bandwidth, **2906**
Rousseau, J., measurement apparatus at 1949 Paris Fair, **2942**; miniature rimlock E-series valves, **565**
Rout, E. R., with D. I. Lawson, pulse deviation meter, **787**
Rowden, R. A., and G. I. Ross, effect of reflections from aircraft on 45-Mc/s reception, **1486**
Rowe, E. G., R. E. B. Wyke and W. Macrae, power diodes, **531**
Rowell, R. M., and N. P. Millar, long-scale instruments, **788**
Rowlands, R. O., constant-phase-shift networks, **3078**
Roys, C. S., transient response of nonlinear systems, **312**
Roys, H. E., crossover filter for disk recording heads, **2470, 3085**; tracing-distortion in gramophone records, **2704**
Rozenblat, M. A., design of push-pull magnetic amplifiers, **1873**
Rubinoff, M., with others, radio investigations of shell flight, **186**
Rückert, H., h.f. amplifier stages with high sensitivity, **1903**
Rudd, J. B., design for double-tuned transformers, **2726, 3063**; insertion characteristics of filters, **985**
—— W. W. Honnor and W. S. McGuire, experimental f.m. broadcast transmitter, **1220, 2939**
Ruddlesden, R., E. Forster and Z. Jelonek, carrier frequency-shift telegraphy, **(D)1180**
Rudeforth, S., variation of contact resistance with current, **3121**
Rüdenberg, R., electron lenses with hyperbolic field structure, **813, 1456**
Rudin, R., direct-reading pulse-length meter, **3480**
Rudmose, H. W., and others, effect of high altitude on threshold of hearing, [illegible]
—— with others, effect of high altitude on speech, **622**
Rudnick, I., and M. N. Stein, free-field calibration of microphones to 100 kc/s in air, **620**
Ruedy, J. E., with others, image-brightness intensifier, **469**
Ruhrmann, A., valve loading and signal shape for long-wave telegraphy transmitters, **2660**
Rukop, H., German valves, **2368**
Rumbaugh, L. H., with others, airborne magnetometers, **815**
Rumsey, V., design of frequency-compensating matching sections, **(A)1612**
Runcorn, S. K., radial variation of earth's magnetic field, **380**
Runge, W., signal/noise ratios for different modulation systems, **3547**
Rushforth, L., S. J. Morrison and J. G. Brett, 15-in. glass toroid for betatron, **471**
Ruston, J., television console design, **883**
Ruze, J., wide-angle metal-plate optics, **(A)1578**
Rybner, J., circle diagrams for 4-terminal networks, **(D)2150**
Rycroft, J. L., with others, elimination of electrical twinning in quartz, **112**
Rydbeck, O. E. H., forced e.m. oscillations in cavity resonators, **995**; propagation of waves in inhomogeneous medium, **2923**
Ryder, E. J., and W. Shockley, dependence of resistivity of Ge on electric field, [illegible]
Ryder, R. M., type-A transistor, **2405**
Ryftin, Ya. A., asymmetrical-aperture scanning, **3559**
Ryle, M., solar r.f. emission, **3413**, origin of, **696**, on λ = 1.7 m and λ = 3.8 m, **(A)373**
—— and F. G. Smith, 80-Mc/s radiation from Cassiopeia and Cygnus, **703**
Rytov, S. M., excitation of spherical resonator by dipole at centre, **3050**
Ryvkin, S. M., capacitor method for investigating photocell e.m.f., **1347**

S

Sabbatini, A., graphical methods for negative-resistance circuits, **1323**; RC filter networks, **3084**
Sacasa, R. G., reception 16000 km away from the transmitter, **3238**
Sacerdote, G. G., absorption coefficient of acoustic resonators, **1264**; measurement of ear fatigue with audiometer, **1568**; measurement of vocal intensity distribution, **1262**; propagation of a.m. sound wave in tube, **926**
Sachse, H., h.f. oxide-rectifiers, **2330**
Saddy, J., photoluminescence of ZnS-Cu, **1684**
Safford, E. L., Jr, radio control of model boats and cars, **2021**
St. George, E., with others, electromechanical strain-gauge multiplier, **(A)1612**
Sălceanu, C., magnetic field of rotating mass, **703**
Salisbury, W. W., resnatron and high-power transmission, **(A)1824**; r.f. system of Rochester 130-in. cyclotron, **(A)1733**
—— J. W. Clark and H. M. Hines, exposure of animals to microwaves, **2284**
Sallnow, C. W., with E. R. Smith, telecommunications for 1948 Olympic Games, **828**
Salow, H. electron cyclotron, **1151**; secondary electron emission, **2501**
Salpeter, E. E., and R. E. B. Makinson, dielectric properties of gas discharge, **1917**
Salpeter, J. L., permanent magnets, **749**
Salvini, G., spherical proportional counters, **462**
Samarski, A. A., and A. N. Tikhonov, radiation resistance of linear aerials, **3064**; waveguides, excitation of, **946**, field in, **291**
di Sambuy, E. B. B., diagram for determining propagation constant, **1580**
Sampaio, P. A., with M. A. Guimarães, G-M counter operation, **3497**
Sampsell, J. W., frequency-characteristic analyser, **1128**
Sampson, E. S., low-distortion a.m. signal generator, **2275, 2574**
Samuel, A. L., electron beams in axial magnetic field, **(A)1639**
—— and C. F. Crandell, waveguide bridge for measuring gain at 4000 Mc/s, **786**
Samuelson, R. E., citizens' radio service, **517**
Samulon, H. A., spectrum analysis of transient-response curves, **(A)1713**
Sandel, B., design of i.f. transformers, **3153**; variable-bandwidth crystal filters, **1889**
Sandeman, E. K., Radio Engineering, **(B)600**; spiral-phase fields, properties and radar applications, **2228**; transmission-line filters, **1617**
Sander, K. F., C. W. Oatley and J. G. Yates, plotting of electron trajectories, **1751**
Sandretto, P. C., R.T.C.A. recommendations for air navigation and traffic control, **2236**
—— and R. I. Colin, design of multiple-function equipment for 960–1660 Mc/s, **(A)1672**
van Santen, J. H., and F. de Boer, refractive index of BaTiO$_3$ and Ti compounds, **2534**
Santo, R. E., light-pattern meter for sine waves on disk records, **624**
Saprykin, K. V., design of output stage of scanning system, **1204**
Sargrove, J. A., printed-circuit technique, **197**
—— and R. E. Blaise, f.m. and ph.m. demodulator, **1170**
Sarkar, N., with H. Rakshit, wide-band f.m., **2362**
Sarna, H. R., and O. Parkash, magnetic storms and cosmic-ray intensity, **3420**
Satow, P. G., charts and chart matching devices, **2303**; radar as marine navigation aid, **1677**
Sauer, H. A., and D. A. McLean, direct-voltage performance test for capacitor paper, **3206**
Savic, P., influence of reactive-feedback networks on galvanometer response, **1014**
Sawyer, J. S., with R. W. Hatcher, sea-breeze structure, **1668**
Saxena, B. D., and K. G. Srivastava, piezoelectric constants of α-quartz, **1685**
Saxton, J. A., electrical properties of water, **3126**; polar diagrams and gain of directive aerials, **(A)2442**
—— and J. A. Lane, absorption of 1.25-cm radiation in supercooled water, **2505**
—— with W. Jackson, microwave absorption effects in liquids and solids, **(A)366, 2244**
—— with J. S. McPetrie, attenuation of u.h.f. e.m. radiation by rock, **(D)819**
Sayers, J., ionization in atmosphere, **1378**
Sayre, D., with others, Waveforms, **(B)2006**
Scaff, J. H., metallurgy of Ge and Si semiconductors, **(A)1681**
Schade, O. H., electro-optics of television camera systems, **540, 1516**
Schafer, C. R., detector for locating metal in timber, **3514**
Schafer, O., equivalent circuit for piezoelectric receiver, **3020**
Schaffer, T. H., and R. S. Gales, masking of multiple tones by noise, **3011**
Schaffernicht, W., German photocells and infra-red image converters, [illegible]
Schaffner, M., with others, experiments in electron optics, **1647**
Schafstein, G., group velocity in feedback amplifiers, **1342**; path time distortion in carrier-frequency amplifiers, **2484**
Schedling, J. A., motion of Fe particles round wire carrying current, **74**
Scheldorf, M. W., multi-V aerial for f.m. broadcasting, **1595**
—— and J. F. Bridges, broad band fan aerials, **2437**
Schelkunoff, S. A., methods of e.m. field analysis, **691**
Schenkel, G., with J. de Boer, electromechanical feedback, **603**
Scherb, M. V., c.r. magnetization-curve tracer, **146**
Schérer, M., with D. Blanc, G-M counters with external cathode, **3212**
Scherer, S. W., h.f. induction and dielectric heating, **2010**
Scherzer, O., resolution limit of electron microscope, **1745**
Schiaffino, P., and L. Albanese, coaxial cables, **3034**
Schlafly, H. J., with R. Wilcox, large-screen television demonstration at Philadelphia, **2652**
Schlesinger, K., astigmatic yoke for television c.r. tubes, **(A)1810; 3570**; locked oscillator, in television reception, **2649**, for television synchronization, **1206**
Schlomka, T., fundamental problem of atmospheric electricity, **3138**
Schmidl, O., aerial arrays with horizontal beams free from side lobes, **2148**
Schmidt, F. H., with others, r.f. system of 184-in. cyclotron, **2016**
Schmidt, R., valve for fault clearance on cables, **559**
Schmitt, O. H., stereoscopic c.r. tube presentation, **2459**
Schmitz, W., simple capacitance meter for electrolytic capacitors, **2834**
Schneider, E. E., with others, direct-reading noise-factor meter, **794**
Schneider, E. G., radar, [illegible]
Schneider, P., initial effects in coupled circuits, **43**
Schneider, W. C., and C. J. Burton, determination of elastic constants of solids by ultrasonic methods, **1732**
Schnitzger, H., valves for frequencies over 1000 Mc/s, **2105**
—— and D. Weber, self-excited oscillations in travelling-wave valves, **3551**
Schoch, A., sound field of piston membrane, **2999**
—— with H. G. Möller, production of pressure pulses by cavitation, [illegible]
Scholefield, H. H., H.C.R., a new soft magnetic material, **2810**
Schott, F. W., with others, network analyser, for cases of rotational symmetry, **316**, for solution of wave equation, **3066**
Schott, J. T., with others, pulse echo measurements on cables, **790**
Schott, L. O., playback for visible speech, **3**
Schouten, J. F., telephony filters and effect of termination and losses, **1891**
—— with others, 48-channel carrier-telephony system, **3251**
Schover, D. S., with others, magnetostriction torquemeter, **463**
Schrader, H. J., with others, teleran, **404**
Schramm, C. W., with others, carrier system with 8-kc/s bandwidth, **2906**
Schreck, C., recent developments in h.f. ceramics, **3447**
Schremp, E. J., noise in linear networks, **1488**
Schrock, N. B., and D. Packard, pulse-counter type f.m. station monitor, **449**
Schroeder, A. C., with K. R. Wendt, a.g.c. for television receivers, **351**
Schröer, E., connections between ionized layers, oxygen-atom layer and radiation, **1929**
Schröter, F. interference-free p.c.m. system, **3551**; new methods of rapid phototelegraphy, **3557**
Schuck, O. H., computer for aerial navigation, **422**
—— and others, bearing deviation indication for sonar, **725**
Schulkin, M., and others, solar noise at 9500 Mc/s and coincident flare, [illegible]
Schulman, J. H., R. J. Ginther and L. W. Evans, CaSiO$_3$-Pb and CaSiO$_3$-(Pb + Mn) phosphors, **735**
Schultz, H. L., and R. Beringer, high-resolution coincidence-counting system, **168**
—— and E. Pollard, coincidence circuit with medium resolution, **975**
Schultz., J. L., television stabilizing amplifier, **3114**
Schultze, H. J., Technische Nomogramme, **(B)1637**
Schulz, E. H., with others, magnetostriction torquemeter, **463**
Schulz, H. R., with W. W. McGoffin, automatic station-call selector, **3262**
Schulze, A., new materials for standard resistors, **1690**
Schulze, W. M. H., insulating materials for u.h.f., **1099**; Si compounds in electrotechnics, **1086**
Schumann, W. O., Elektrische Wellen, **(B)1562**; plasma oscillations, **2175**
Schut, V. F., and C. W. Kosten, permissible nonlinear distortion in amplifiers, **3107**
Schwartz, E., German c.r. tubes, **2368**; television standards in Germany, England and U.S.A., **1210**
Schwartz, J., electronic gauges, **1736, 2009**
Schwartz, L. S., heterodyne method of pulse power measurement, **2093**; optimum frequency for line-of-sight systems, **481**; oscillator power variation with mismatched feeder, **1894**
Schwarz, E., new photocells, **1102**; photoconductivity of semiconductor layers, **3578**
Schwarz, R. J., low-power frequency multipliers, **340**
Scoles, G. J., with H. Whalley, radar observation of heavy rain, **1675**
Scolnik, R., with others, measurement of characteristics of quartz crystal units, **137**
Scott, F. R., R. H. Thompson and R. T. Ellickson, inertia effects in infra-red-sensitive phosphors, **1950**
Scott, H. H., dynamic noise suppressor, **275**
—— H. Chrystie and E. G. Dyett, Jr, miniature sound-level meter, **2418**
Scott, J. C. W., abacs for ionospheric control points, **3235**; critical-frequency difference variations in ionosphere, **2516**; magneto-ionic measurements in high latitudes, **717**
Scott, R. A., with others, SiC semiconductors, **3168**
Scott, W. E., five international quiet and disturbed days, Jan.–June 1947, **383**; quiet and disturbed days for 1947, **707**
Scrase, F. J., wind and temperature measurements up to 30 km, **3428**
Scroggie, M. G., audio signal generator, **3487**; cathode follower as d.c. potential divider, **1004**; Radio Laboratory Handbook, **(B)3492**; reflex valve voltmeter, **3476**; stabilized power supplies, **231, 883, 1200**; Television, **(B)2357**
Seal, P. M., square-wave analysis of compensated amplifiers, **1626, (C)2192**
Sears, R. W., beam-deflection tube for p.c.m., **576**
Seaton, N. T., FP-54 as stable voltage amplifier, **55**; precision automatic electrometer, **3423**
Seaton, S. L., with N. C. Gerson, generalized magneto-ionic theory, **1464**
Seay, P. A., with others, vertical angle of arrival of u.h.f. waves, **2299**
Seeber, R. R., Jr, IBM selective-sequence calculator, **(A)2545**
Seeley, S. W., with others, determination of aircraft ground speed using pulse-Doppler radar, **(A)1672**
de Seguin, L., G. Castelain and M. Pelletier, biological effects of microwaves, **2283**
Seiler, K., detectors, **2330**; Swiss 200 kW m.f. broadcasting transmitter, **534**
Seitz, F., theory of rectification, **(A)1681**
—— with G. R. Fonda, Preparation and Characteristics of Solid Luminescent Materials, **(B)126**
Selby, M. C., primary h.f. voltage standard, **2555**
—— with others, measurement of characteristics of quartz crystal units, **137**
Selgin, P. J., plotting of electron paths, **357**
Selman, G. G., and M. H. F. Wilkins, production of high-intensity ultrasonics for biological applications, **2694**
Sen, S. K., with B. M. Banerjee, gas-filled double photocell in current stabilizer, **896**
de Senarclens, G., preparation and properties of silicones, **1687**
Sennewitz, L., Rochelle salt crystals in telephony equipment, **2708**
Servajean, R., with M. Laffineur, exceptional solar radiation during 8th May [illegible], **3129**
Sette, D., plastic ultrasonic lenses, **(A)1421, 3008**
Sev, A., double-diversity equipment for reception of s.s.b. R/T, **2898**
Sewell, D. C., with others, e.m. deflector for beam of 184-in. cyclotron, **472**
Shadowitz, A., with M. Silver, high-ratio multivibrator frequency divider, **52**
Shain, C. A., with others, moon echoes and penetration of ionosphere, **2030**
Shalimova, K. V., quenching of photoluminescence of KI-Tl phosphors, **2242**
Shanklin, J. P., omnidirectional aircraft receiving aerial for 108–122 Mc/s, **(A)1578**
Shannon, C. E., computer programming for playing chess, **(A)1703**; synthesis of 2 terminal switching circuits, **2456**; theory of communication, mathematical, **1381**, in presence of noise, **1849**
—— with others, p.c.m., **843**
Shapiro, G., and R. L. Henry, subminiature i.f. amplifiers, **(A)1612**
Sharp, J. M., with S. L. Brown, filter analysis by mechanical harmonic synthesis, **3373**
Sharpe, B. A., low-reading absolute altimeters, **97**

Sharples, E. A., with T. S. England, microwave dielectric properties of human body, **2282**
Shaw, R. C., and others, 6-channel mobile system, **(A)1785**
Shaw, R. F., with others, Hg delay-line memory, **3082**
Sheets, J. W., with K. S. Lion, r.f. gas-discharge phenomenon and mechanical measurement, **(A)1733**
Shelton, G. R., E. N. Bunting and A. S. Creamer, properties of ceramic dielectrics, **2537**
—— A. S. Creamer and E. N. Bunting, properties of Ba/Mg titanate dielectrics, **414**
Shenkel, G., with J. de Boer, electromechanical feedback, **693**
Shepard, F. H., Jr, and E. Osterland, peak-to-peak voltmeter, **440**
Shepard, L., rejuvenation of G-M counters, **2870**
Sheppard, C. B., with others, Hg delay-line memory, **3082**
Sheppard, G. E., resnatron, **1552**
Sheppard, H. F., design for an electronic brain, **(D)1739**
Sheridan, V. A., Q-meters, **(D)2287**; simple bridge for measurement of L and k, **3188**
Sherman, J. B., medium-definition television camera, **234**
Shipton, H. W., with others, hum reduction in valves, **(D)1241**
Shive, J. N., double-surface transistor, **2108**
—— with J. A. Becker, Type-A transistor, **2404**
Shmoys, J., reflection from dielectric obstacle in waveguide, **1284**
Shockley, W., with J. R. Haynes, hole injection in transistor action, **2109**
—— with E. J. Ryder, dependence of resistivity of Ge on electric field, **1688**
Shoupp, W. E., nuclear physics, electronics in, **1148**, investigations with e.s. generator, **484**
Shubina, L. A., and Ya. S. Shur, magnetic structure of alnico and vicalloy, **1954**
Shur, Ya. S., with L. A. Shubina, magnetic structure of alnico and vicalloy, **1954**
—— with others, magnetic structure of alnico, **1955**
Sichak, W., and S. Milazzo, aerials for circular polarization, **2142**
—— with others, high gain with discone aerials, **303**
Sicinski, L., with others, over-sea propagation for λ 3 cm and λ 9 cm, **2034**
Siday, R. E., with W. Ehrenberg, refractive index in electron optics, **1455**
Siezen, G. J., and F. Kerkhof, 25-kV supply for projection television receiver, **1808, 3275**
Sigrist, W., u.s.w. amplifier problems, **1629**
Sillars, R. W., dielectric and semiconducting materials, **(A)3442**
—— with others, SiC semiconductors, **3168**
Silver, M., high-ratio multivibrator frequency-divider, **3100**; monitor for television broadcasting stations, **450**
—— and H. French, studio/transmitter radio link using klystrons, **220**
—— and A. Shadowitz, high-ratio multivibrator frequency divider, **52**
—— H. French and L. Staschover, video design considerations for television link, **(A)1785**
Silver, S., Microwave Antenna Theory and Design, **(B)2721**
Simon, A. W., theory of coil winding, **(D)3390**
Simon, M., with G. Joyet, temperature effect in alcohol-argon-filled G-M tubes, **(A)1140**
Simpson, F. W., with others, ultrasonic absorption in sea water, **612**
Simpson, G. C., atmospheric electricity during disturbed weather, **(A)394**
Simpson, O., effect of room-temperature radiation on infra-red response of PbTe films, **741**
Sinclair, G., radiation from inclined slots on cylinders, **(A)1578**; slotted-cylinder aerial polar diagrams, **(A)309, 958**; theory of models of e.m. systems, **692**
Singer, G. H., Jr, with others, analogue computer for tenth-degree algebraic equations, **2548**
Singer, K., variable band-suppression filter, **59**
Singh, R. N., with S. S. Banerjee, periodic fading of s.w. signals, **1166**
Sixtus, K., new ferromagnetic materials, **3437**
Skal'skaya, I. P., point current source on earth's surface above inclined strata, **1358**
Skanavi, G. I., and A. I. Demeshina, polarization and losses in polycrystalline dielectrics, **1971**
Skellett, A. M., electron resonator, palletron, **810**; radial-beam valve with e.s. focusing, **907**
Skilling, H. H., Fundamentals of Electric Waves, **(B)1838**
Skyrme, T. H. R., with R. E. Peierls, electrolyte tank and magnetic problems of axial symmetry, **1988**
Slater, J. C., design of linear accelerators, **2595**
—— and N. H. Frank, Electromagnetism, **(B)75**
Slätis, H., γ-ray counters with increased efficiency, **2873, 3214**
Slaymaker, F. H., and M. E. Hawley, acoustic impedance matching by means of screens, **610**
Sleeper, M. B., f.m. receiver specification, **494**; stratovision broadcasting tests in U.S.A., **233**
Slemon, G. R., radio interference from h.v. corona, **1780**
Slinkman, R. W., dual-control-grid pentode, **2968**
Sloane, R. H., and C. S. Watt, negative-ion emission from oxide cathodes, **563**
Slonczewski, T., standard capacitors, **160**; transconductance as criterion of valve performance, **2949**
—— with others, airborne magnetometers, **815**
Slooff, F. C. W., M. van Tol and J. M. Unk, receiver for high-speed facsimile, **2657**
—— with others, transmitter for high-speed facsimile, **2656**
Slurzberg, M., and W. Osterheld, Essentials of Radio, **(B)272**
Smale, J. A., commercial point-to-point radiotelegraphy, **(D)1182**
Smee, J. F., with others, 20-MeV betatron, **179, (D)2014**
Smidt, J., permeability of iron at 360–580 Mc/s, **2243**
Smit, A., with others, reflection of sound by porous media, **1850**
Smith, C. E., stub tuners for power division, **57**
—— and R. A. Fouty, circular polarization in f.m. broadcasting, **528**
Smith, D. A., simplified television recording system, **3278**
Smith, D. Y., mass-production techniques for television c.r. tubes, **(A)2678**
Smith, E. H. Frost, magnetic amplifiers, **3350**
Smith, E. R., and C. W. Sallnow, telecommunications for 1948 Olympic Games, **828**
Smith, F., cooled-anode valves, **(A)1826**
Smith, F. G., with M. Ryle, 80-Mc/s radiation from Cassiopeia and Cygnus, **702**
Smith, F. W., heater supplies for a.f. amplifier hum reduction, **677**
Smith, K. D., with J. F. Wentz, microwave television system, **851**
Smith, M. C., and R. T. Beyer, ultrasonic absorption in water at 0°–80°C, **686**
Smith, P. B., dead-time reduction in self-quenching counters, **165**
Smith, P. D. P., biconical aerials, **(D)3341**; tensor field equations for region of variable refractive index, **3517**, wide-angle conical dipole, ground-plane field of, **3340**; impedance of, **644**
Smith, P. H., high-gain cloverleaf aerial, **2435**; r.f. transmission-line abacs, **1274**
Smith, P. T., and H. R. Hegbar, double-tetrode u.h.f. power valves, **906**
Smith, R. W. K., D. H. Ewing and H. J. Schrader, teleran, **404**
Smith, S. B., and K. W. Tremellen, future of e.m. wave propagation research, **1470**
Smith, W., Antenna Manual, **(B)964**
Smith, W. V., with J. L. G. de Quevedo, frequency stabilization of microwave oscillators by spectrum lines, **1608**
—— with R. R. Unterberger, microwave secondary frequency standard, **1114**
Smith-Rose, R. L., e.m. wave propagation research in Department of Scientific and Industrial Research 1937–1946, **189**; international radio conferences, 1948, **2411**; radio field-strength measurement, **(A)428**; recent progress in radio d.f., **1393**
Smoliar, G., with others, dynamically regenerated memory tube, **(A)1703**
Smoot, W. S., television in airliner, **1441**
Smullin, L. D., and C. G. Montgomery, Microwave Duplexers, **(B)354**
Smythe, W. R., microwave fields in narrow gaps, **2149, (C)2444**
Snadow, R., modern developments in insulation, **117**
Sneath, O. B., and E. G. Mayer, electromedical pulse generators, **2020**
Snijders, M. J., water-jet cooling of transmitting valves, **2664**
Snoek, A. P., and C. J. Gorter, photoelectric voltages with intermittent light, **1915**
—— with others, photoelectric voltages with intermittent light, **1916**
Snoek, J. L., dispersion and absorption in magnetic ferrites at frequencies above 1 Mc/s, **3160**
Snow, C., standard of small capacitance, **2650**
Sobczyk, A., stabilization of carrier-frequency servomechanisms, **857**
Sobel, A. D., television receiver front ends, **544**
Sobolev, M. A., with others, design of high-power modulation transformers, **968**
van Soest, J. L., Dutch radiosonde, **3501**
Sokolov, J., design of television i.f. amplifiers, **1635**
Soldi, M., phase-shift oscillators with very tight coupling, **2757**
Soller, T., M. A. Starr and G. E. Valley, Jr, Cathode Ray Tube Displays, **(B)3601**
Solodovnikov, V. V., stability and efficiency of monitoring and regulating systems, **2331**
Somayajulu, Y. V., with N. S. Subba Rao, rapid fading in m-λ broadcast reception in India, **2035**
Somerville, J. M., K. S. W. Champion and E. K. Bigg, glow discharge between coaxial cylinders, **2781**
Somerville, T., acoustics of Liverpool and Glasgow concert halls, **1849**
—— and S. F. Brownless, listeners' sound-level preferences, **1266**
Sommer, H., with others, mass-spectrometer type leak detector, **408**
Sommer, J., diagrams for output-transformer design, **970**
Sondheimer, E. H., with G. E. H. Reuter, theory of anomalous skin effect in metals, **1354**
Soria, R. M., and T. J. Higgins, approximate calculations for waveguides, **293**
Sosnovkin, L. N., with B. A. Mamyrin, experimental investigation of quartz crystals, **412**
Soutif-Guicherd, J., and P. Grivet, measurement of magnetic permeability at u.h.f., **2841**
Sowerby, J. McG., see-saw or anode-follower circuit, **678**
Soyck, W., with E. Albers-Schoenberg, dielectric properties of $MgTiO_4$ ceramics, **1414**
Spälti, A., oscillator modulation by resistor noise and shot effect, **3380**
Spangenberg, K., G. Walters and F. W. Schott, network analyser, for cases of rotational symmetry, **316**, for solution of wave equation, [illegible]
Sparks, C. M., with C. Moon, capacitance standards, 0.001–5 pF, **1439**
Speirs, L., resistance measurement for thin metal films at cm λ, **766**
Spellman, W., 30-kV d.c. stabilized power supply, **3267**
Spence, R. D., Kirchhoff approximation in diffraction theory, **2691**
Spencer, J. G., with F. G. Newall, phase discriminator for f.m. reception, **1001**
Spenke, E., boundary-layer theory of dry rectifier, **2917**
Spindell, F. A., fixed-frequency f.m. tuners, **1911**
Spratt, H. G. M., function and applications of Q meters, **1121**; noise and its measurement, **1848**; valve megohmmeters, **153**; watch-rate recorder, **1710**
Spreadbury, F. G., Electronics, **(B)2890**
Sreekantan, B. V., with S. K. Chatterjee, absorption of u.h.f. waves in salt solutions, **1027, 1921**; Type 833-A valve as u.h.f. oscillator, **48**
Srivastava, K. G., with B. D. Saxena, piezoelectric constants of α-quartz, **1685**
Stacy, J. E., low-noise v.h.f. converter, **3536**
Stahl, H. A., effect of BaS on emission of oxide cathodes, **3591**
Stambach, G. L., rotating probe for magnetron field plotting, **1714**
Standard Telephones and Cables Ltd, Standard Valves, **(B)2078**
Standing, A. F., with T. W. R. East, circular-timebase frequency comparator, **2854**
Stanesby, H., and W. K. Weston, London-Birmingham television cable, **1279, 1857**
Stanley, A. W., series-capacitor valve-heater circuits, **564**
Stanley, J. K., and T. D. Yensen, hiperco, a magnetic alloy, **751**
Stanner, W., application of constant path-time difference in radar, **1673**
Stansfield, R. G., statistical theory of d.f. fixing, **1069**
Starke, H. F., electrometer tubes and circuits, **(A)1824**; subminiature electrometer valve, **2967**
Starkey, B. J. See also Starnecki, B. J.
Starkey (Starnecki), B. J., with J. S. McPetrie, effect of low-level atmospheric ducts on propagation, **2609**
Starkiewicz, J., PbSe photoconductive cells, **899**
Starnecki (Starkey), B. J., and E. Fitch, mutual impedance of centre-driven parallel aerials, **1295**
—— with J. S. McPetrie, low-level atmospheric ducts, **1167, (D)2033**
—— with others, over-sea propagation for λ 3 cm and λ 9 cm, **2034**
Starner, C. J., 50-kW f.m. transmitter, **549**
Starr, M. A., with others, Cathode Ray Tube Displays, **(B)3601**
Staschover, L., with others, video design considerations for television link, **(A)1785**
Staub, F., use of frequency filters in u.s.w. multichannel systems, **3545**
Stecca, A. J., LC toroidal and parallel-T feedback-amplifier filters, **(A)1612**
Stedman, C. K., with others, bearing deviation indication for sonar, **725**
Stedman, G., e.m. units and definitions, **684**
Steeple, H., Manchester electronics exhibition, **3506**
Steffenhagen, K., application of elliptic functions sn to the calculation of filters, **1319**
Stehlik, F. E., wide-band crystal filter for carrier programme circuits, **679**
—— with others, filters and phase-simulating network for carrier system, **2752**
Steier, H. P., and R. D. Faulkner, manufacture of R.C.A. c.r. tubes Type 16AP4, **2341**
—— and others, 16-in. metal kinescope for television, **2399**
Stein, M. N., with I. Rudnick, free-field calibration of microphones to 100 kc/s in air, **620**
Stein, W., with others, solution of 2-beam electron-wave-valve equation, **(A)1824**
Steinberg, J. L., maximum sensitivity of u.h.f. radiometers, **1993**
—— with Y. Rocard, r.f. noise from thunderclouds, **2797**
Steinhoff, J. R., automatic direction finder, **1394**
Steinitz, R., magnets made from pure iron powder, **2816**; permeability of powdered-iron compacts in relation to sintering temperature, **3455**
Steinmann, W., and E. Huber, Zurich-Geneva multichannel R/T link, **215**
v. Steinwehr, H., replacement of international by absolute electrical units, **3398**
Stenzel, H., sound field of circular membrane in rigid wall, **2415**
Stephenson, J. G., a.f.c. system for mechanically tuned oscillators, **(A)1612**
Stern, E., measurements on i.f. transformers, **3193**
Sterns, W. G., with others, High Frequency Measuring Techniques using Transmission Lines, **(B)2866**
Stetson, H. T., ionization and radio reception 1944–1947, **1035**; ionospheric propagation 1945–1947, **(A)2029**
—— and G. W. Pickard, WWV field-intensity measurements, **491**
—— with G. W. Pickard, tropospheric effects on ionospheric propagation, **2611**
Stevenson, A. F., theory of slots in rectangular waveguides, **639**; theory of waveguides, **3335**
—— with others, theory of waveguides, **3335**
Stewart, J. C., numerical computation of sn(mK/n), **2543**
—— and K. M. Garven, universal curves for band-pass filter calculations, **2749**
Stewart, R. W., with J. I. Lodge, h.f. discharges in rarefied gases, **362**
Stewart, W. E., R.C.A. Type RT-3A portable tape recorder, **2709**
Stiber, S., with L. J. Giacoletto, m.f. crossed-loop d.f. set, **3431**
Stibitz, G. R., counter computers, **(A)1703**
Stigant, S. A., Kron's work on tensor analysis, **127**
Stille, U., electrical units in last 100 years and change to absolute units, **3397**
Stockman, H., communication by means of reflected power, **521**
—— F. R. Dickey, Jr, and A. G. Emslie, extraction of weak signals from noise by integration, **2612**
Stodola, E. K., with J. H. DeWitt, Jr, radio signals reflected from moon, **1937**
Stoffregen, W., ionosphere echo recorder, panoramic, **789**, with repetition-frequency converter, **1438**
Stoiber, J., with others, television recording camera, **236**
Stokes, R. G., variable-frequency standard signal generator, **157**
Stolaroff, M., with H. Lindsay, magnetic-tape recorder, **278**
Stoll, P., M. Walter and W. Zünti, mixer stages of coincidence amplifiers, **(A)976**
Stone, R. P., with others, television transmitter for 500–900 Mc/s, **1531**
Storer, J. D., valve-assisted a.f. filter, **3083**
Störmer, C., heights of auroral forms from South Norway, **784**
Strack, W., with others, 6-channel mobile system, **(A)1785**
Straiton, A. W., deduction of atmospheric refractive index from radio observations, **2025**; phase front measurements over sea for λ 3.2 cm, **3241**
—— W. E. Gordon and A. H. LaGrone, method of determining angle of arrival, **1481**
—— with E. W. Hamlin, phase difference for two vertically spaced aerials, **1157**
Straker, T. W., with R. N. Bracewell, solar flares and phase of very long reflected radio waves, **3416**
Strandberg, M. W. P., C. Y. Meng and J. G. Ingersoll, microwave absorption spectrum of oxygen, **3410**
Strans, D., ozone radiosonde, **169**
Strasberg, M., radiation from diaphragm struck periodically, **606**
Strecker, F., stability criterion for active networks, **2463**
Street, R., absolute measurement of low power at 3000 Mc/s, **2840**
Strelkov, S. P., general theory of linear amplifiers, **2187**
Strong, C. E., classification of radio position-finding systems, **1674**
Strum, P. D., performance of mixer crystals, **(A)1769**
Struszynski, W., and J. H. Marshall, symmetrical screened transformers for h.f. d.f., **969**
—— E. G. Robus and J. C. Woolley, measurement of resonance frequency of reradiating structures, **1132**
—— with others, aerial systems for h.f. d.f. in ships, **1075**; performance of h.f. direction finders in ships, **1063**; performance of multi-aerial Adcock d.f. systems, **1061**
Strutt, M. J. O., limitation of v.h.f. and u.h.f. reception by noise, **1487**; limits of valve gain and power output at u.h.f., **1332**; permeability of ferromagnetic materials at u.h.f., **1409**; sensitivity of dm-λ amplifier and mixer stages, **2312**
—— and A. van der Ziel, electron-inertia effects in valves, **254, 1233**; spontaneous fluctuations in amplifier valves for m and dm waves, **1631**; v.m. valves as u.h.f. preamplifiers, **(D)3106**
Studer, F. J., and D. A. Larson, emission spectra of ZnS-CdS phosphors, **(D)734**
Stumpers, F. L. H. M., distortion of f.m. signals in networks, **2038**; measurement of induced grid noise, **(D)3311**; noise in a p.f.m. system, **1778**; theory of f.m. noise, **203**
—— and W. W. Boelens, measurement of distortion in frequency modulator, **1991**
—— with W. W. Boelens, measurement of hum and noise, **2837**
Sturley, K. R., combined current and voltage feedback, **2195**
Sturtevant, J. M., voltage-controlled multivibrator, **3381**
—— with E. C. Pollard, Microwaves and Radar Electronics, **(B)3152**
Suart, R., hot-cathode gas-filled rectifying valves, **1547**; quality control for receiving valves, **1117**
Subba Rao, N. S. See Rao, N. S. Subba.
Subrahmanyam, D. L., with N. B. Bhatt, electronic reverberation recorder, **6**
Sueur, R., carrier-current systems on aerial lines, **1497**; repeater for Paris/Toulouse coaxial cable, **212**
—— with J. Malézieux, repeater-station equipment, **1493**
Sullinger, W. B., with J. Z. Millar, microwave system for television relaying, **(A)1785**
Sullivan, A. H., Jr, German electronics in World War II, **(A)466, 2681**
Sulzer, P. G., applications of screen-grid supply impedance in pentode circuits, **258**; frequency-sweep ionosphere equipment, **2004**; L-section low-pass filter design, **3370**; noise figures for receiver input circuits, **2315**; positive feedback in miniature equipment, **3112**; tapered-phase-shift oscillator, **335**; vector voltage indicator, **2853**; wide-range sawtooth generator, **1901**
—— with others, polar vector indicator, **2569**
Summer, W., design for an electronic brain, **(D)1739**
Summerhayes, H. R., Jr, a.m. broadcast station monitor, **(A)1713**
Summers, W. P., with A. S. Meier, impedance of vertical aerials over finite ground planes, **2440**
Sunde, E. D., Earth Conduction Effects in Transmission Systems, **(B)3554**
—— with H. M. Trueblood, currents produced in underground cables by lightning, **2799**
Surber, W. H., Jr, universal curves and permittivity measurement for dielectric-filled waveguides, **1433**
—— and G. E. Crouch, Jr, microwave dielectric-constant measurements for solids, **1717**
Surdin, M., sensitivity limit of galvanometers, **3200**
Susskind, C., microwave lenses, **3339**
Sutherland, G. B. B. M., and G. S. Callendar, infra-red absorption spectra of atmospheric gases, **1348**
Sutter, H., with others, domain structure of $BaTiO_3$ crystals, **(A)1089**
Sutton, O. G., diffusion in the lower atmosphere, **1667**
Svensson, S. L., pulse equipment and water load for high-power magnetrons, **579**
Sveshnikov, B.Ya., extinction of luminescence of organic phosphors, **1682**
Swaffield, J., with R. J. Halsey, R/T and the vocoder, **513**
Swallow, J. C., with S. de Walden, aural-null and visual methods of d.f. bearing display, **3142**
Swann, W. F. G., relative efficiency of magnetrons of different sizes, **578**
Symonds, J. L., with J. M. Cowley, electron diffraction and rectification from Si and pyrite surfaces, **1952**
Synge, J. L., general problem of aerial radiation, **1859**
—— with G. E. Albert, general problem of aerial radiation, **1859**
—— with others, theory of waveguides, **3335**
Syrdal, R. R., with W. H. Kliever, magnetic compass with c.r. sensing element, **799**
Sze-Hou Chang. See Chang, Sze-Hou.

T

Taeger, W., design of magnetic voltage stabilizers, **3264**
Taft, E., with others, photoelectric emission and contact potentials of semiconductors, **1088**
Tai, C. T., biconical aerials, e.m.f. method of calculating input impedance of, **3343**, theory of, **1588**; h.f. polyphase transmission line, **637**, **(C)1579**
Tait, A., with E. F. Florman, electronic phase meter, **1726**
Tait, G. W. C., vertical temperature gradient in lower atmosphere, **3136**
Tait, J. F., and G. H. Haggis, demountable G-M counter using helium ether mixture, **3496**
Tak, W., measurement of reverberation time, **5**
Tamarkin, P., with others, scattering of ultrasonic waves in water by cylindrical obstacles, **609**
Tanner, R. H., technique of television sound, **(A)1563, 1851**
Taraboletti, A., with A. Pinciroli, matrix analysis of linear active networks, **2744**
v. Tarnoczy, T., investigations with artificial vocal resonators, **3012**
Tarpley, R. E., with others, stabilized d.c. amplifier, **2563**
Tatom, L. J., and H. E. Bernstein, standardization of components by A.S.E.S.A., **2445**
Taylor, C., background noise in RCA 931A photomultiplier, **3298**
Taylor, E. W., vertical-incidence absorption and sun's zenith angle, **2026**
Taylor, H. E., and D. Fowler, v.h.f. helical aerial design, **1861**
Taylor, P. K., s.s.b. crystal filters, **349**
Taylor, R. C., filters for 150-kc/s carrier system, **2471**
Taylor, R. E., feeders for turnstile aerials, **1298**
Taylor, T. T., maximum directivity of aerial, **(D)21**
Teal, G. K., M. D. Rigterink and C. J. Frosch, materials for microwave attenuators, **1691, 2535**
Tellegen, B. D. H., gyrator as network element, **980**; synthesis of passive resistanceless quadripoles, **2745**; synthesis of passive 2-pole networks, **3364**; transient response of networks, **36**
Tellier, J. C., limiter discriminator f.m. detector in presence of impulse noise, **500**
Tellier, R., with H. Josse, use of de Sauty bridge for fault finding in cables, **283**
Teszner, S., theory of semiconductors and complex derivatives, **3446**
Tetenbaum, S. J., and S. G. Lutz, electron tube for viewing magnetic fields, **2375**
Thayer, G. N., and others, broad-band microwave relay system, New York-Boston, **1793**
Thellier, E., and O. Thellier, magnetic storms and solar cycle, **1657**
Thellier, O., with E. Thellier, magnetic storms and solar cycle, **1657**
Thibieroz, L., cost-reduction methods in S.F.R. valve factory, **2952**
Thiede, H., applications of phase devices, **2454**
Thiemann, H., eidophor process for large screen television, **(A)875, 3561**
Thien-Chi Nguyen. See Nguyen, Thien Chi.
Thiessen, G. J., J. R. Leslie and F. W. Simpson, ultrasonic absorption in sea water, **612**
Thomas, A., h.v. supplies for G-M counters, **1195**
Thomas, A. R., nonlinearity in feedback amplifiers, **(D)2300**
Thomas, D. E., Applied Electronics, **(B)2295**
Thomas, Horace A., industrial applications of electronic techniques,

(D)467; world distribution of radio noise, (A)396
Thomas, H. A., H. Sommer and R. Wall, mass-spectrometer type leak detector, 408
Thomas, H. G., with others, telemeter for carrier-current channels, 2588
Thomas, L. A., with others, elimination of electrical twinning in quartz, 112
Thomasson, D. W., c.r.o. panoramic display, 154
Thompson, R. H., with others, inertia effects in infra-red-sensitive phosphors, 1960
Thompson, S. P., calibration of standard transducers, 619
Thomson, J., transit-time effects in u.h.f. valves, 3312, (D)3313
Thomson, W. E., transient response of wide-band amplifiers, 3105
—— with others, construction of zenithal-equidistant maps, 591
Thornhill, W. T., and E. W. Beasley, influence of corona on design of h.v. apparatus, 70
Thornton, J. B., A. S. Popov, (D)2113
Thornton, R. L., with others, e.m. deflector for beam of 184-in. cyclotron, 472
Thurston, W. R., coaxial elements and connectors, 437; impedance meter for 50–500 Mc/s, (A)1713
Tiberio, U., measurement of dielectric constant of solutions at h.f., 1432; minimum detectable radar signal, (D)396
Tickner, A. J., with others, airborne magnetometers, 815
Tierney, W. L.; repeater buildings for New York/Boston radio link, 221
Tihelka, F., with G. Willoner, phase-shift oscillator with wide-range tuning, 45
Tikhonov, A. N., with A. A. Samarski, radiation resistance of linear aerials, 3054; waveguides, excitation of, 946, field in, 291
Titterton, E. W., characteristics of glow-discharge voltage-regulator tubes, 1804
Toczylowski, H. S., with C. Crampton, field-strength estimation by means of h.f. direction finders, 1118
Todd, F. C., photoelectric control of high-temperature furnaces, 2581
van Tol, M., with D. Kleis, facsimile transmitter and receiver synchronization, 2925; high-speed facsimile transmission, 2923
—— with others, high-speed facsimile equipment, 2338, receiver for, 2657
Tolles, W. E., applications of saturable-core magnetometer, 436
Tolstikov, V. A., coupled systems and u.h.f. f.m., 2475
Tomkins, A. A., surgeless volume expansion, (C)42
Tomlinson, T. B., video-amplifier testing with square-wave generator, 3099
Tomner, J. S. A., development of travelling-wave valves, 561
Toombs, R., with F. C. McLean, unattended low-power B.B.C. transmitting stations, 223
Topchibashev, M. A., characteristics of nonlinear resistors, 1875
Torreson, O. W., with others, pre-history of earth's magnetic field, 1045
Toth, E., a.m. and f.m. in u.h.f. naval communication, 1504
Toulon, P. M. G., television scanning, 'knight' method, (A)870
Tournier, A., production of piezoelectric substances, 1406
Trautman, D. L., Jr, and J. M. Pettit, amplifier synthesis by means of conformal transformations, (A)1612
Travis, E. F., and T. M. Wilson, r.f. capacitance meter, (A)1713
Tremellen, K. W., and J. W. Cox, wave propagation and s.w. communication, (D)483
—— with S. B. Smith, future of e.m. wave propagation research, 1479
Troublé, M., laying of long-distance cables, 1277
—— with H. Mermoz, hysteresis distortion of Pupin coils, 1168
Trueblood, H. M., and E. D. Sunde, currents produced in underground cables by lightning, 2799
Truell, R., measurement of strength of h.f. e.m. fields, 429
Tsarev, B. M., electrometer valves, 1236
Tschu, K. K., with S. Chapman, lunar atmospheric tides, 1382
Tschudi, E. W., transfer functions for RC and RL equalizing networks, [illegible]
Tuck, J. L., with T. R. Kaiser, air-cored synchrotron, 1149
Tucker, D. G., analysis and design of ring and Cowan modulators, (D)2944; balanced-rectifier modulators, (D)1224; pseudosynchronization of amplitude-stabilized oscillators, (D)329
—— and J. Garlick, selective transmission measuring equipment, 767
—— and G. F. Machen, constancy of small rectifiers, 657
—— and J. F. Ridgway, synchrodyne receiver, 3533
Tucker, M. J., h.v. ring modulator, 3293
Tucker, S. A., reduction of receiver production costs, 3531
Tull, W. J., and N. W. MacLean, ground position indicator automatic navigational computer, 1896
Tuller, W. G., potted units for subminiature equipment, 3441; theory of communication, 2319
Turnbull, J. C., with R. D. Faulkner, envelope of metal kinescope, (A)1824
Turner, W. R., with others, square-law power-level recorder, 2572
Turney, A., with J. Lamb, dielectric properties of ice at λ 1.25 cm, 2532
Tustin, A., analysis of linear servomechanisms, 2329; closed-cycle control systems, nonlinearity in, 2329, stability of, 2329
Tuttle, W. N., thyratron control of a.c. commutator motors, 473

U

von Ubisch, H., hot-wire vacuum gauges, 731, 2528
Umpleby, K. F., airborne automatic direction finders, 1058
Underhill, B. B., cathode-tapped cathode followers, (A)345
Underhill, E. A., German applications of infra-red in war, 457
Unk, J. M., with others, high-speed facsimile, receiver for, 2657, transmitter for, 2656
Unsöld, A., origin of r.f. galactic radiation, 2217
Unterberger, R. R., and W. V. Smith, microwave secondary frequency standard, 1114
Urbach, K., metal detector for use with conveyor belts, 2883
Urick, R. J., and W. S. Ament, propagation of sound in composite media, 2686
Ursell, F., with N. F. Barber, response of resonant system to gliding tone, 670
Urtel, R., feedback; kipp oscillations, 2175
Uttley, A. M., with F. C. Williams, velodyne, (D)2155

V

Valentine, J. M., with E. C. Horstman, WENR-TV station, Chicago, 2935
Vallarino, A. R., and M. S. Buyer, harmonic distortion in f.m. discriminator, 3534
Vallese, L. M., network representation of amplifier admittances, 2194
—— with E. M. Williams, wide-deviation f.m. oscillators, 331
Valley, G. E., Jr, and H. Wallman, Vacuum Tube Amplifiers, (B)1638
—— with others, Cathode Ray Tube Displays, (B)3601
de Valroger, L., coupled h.f. and m.f. circuits, 673
Van Beuren, J. M., cost *vs* quality in a.f. amplifiers, 1845
Vanderleck, J. M., a.c. potentiometer, 1436
Vanderlyn, P. B., with H. A. M. Clark, double-ratio a.c. bridges with inductively-coupled ratio arms, (A)1126, 2850
Vandeven, E. O., phase meter, 446
Van Dyck, A. F., with others, Frequency Modulation, Vol. 1, (B)529; Radio at Ultra-High Frequencies, Vol. 2, (B)923
Van Mierlo, S., pulse communication systems, 2324
Van Scoyoc, J. N., cross-coupled input and phase inverter circuit, 2446
—— and J. L. Murphy, high-*Q* variable reactance, 1010
—— and G. F. Warnke, direct-coupled amplifier with cross-coupled input circuit, (A)1612
Van Voorhis, S. N., Microwave Receivers, (B)206
Varney, R. L., television interference, from H.R.O. receiver, 3287, suppression of, 2286
Vasserman, I. L., space charge in whole-anode magnetron, 260
Vasseur, J. P., diffraction of e.m. waves by plane screen, 3124
Vaudetti, R., modulation systems for R/T transmitters, (A)1533
Vauthier, René, electron optics of magnetic field bounded by parallel planes, 3209
Vautier, Roger, longitudinal magnetostriction of ferrites of Ni and Mg, 3163
Vecchiacchi, F., Milan/Rome 7-channel u.s.w. R/T link, 1506
Veith, H., dependence of d.c. resistance and loss angle of paper on its dryness and temperature, 3448
Veith, W., electron-optics of image converter, 2294
van der Velden, H. A., and P. M. Endt, fluctuation problems for G-M counters, 1139
Veneklasen, P. S., measurements of loudspeaker performance, 2907
Venton, H. R., with others, F_2-layer abnormalities, Brisbane, 1668
Vergunas, F. I., and F. F. Gavrilov, ZnO and ZnS-Zn phosphors, 1683
Vermeulen, R., duplication of concerts, 1572
Versey, H. V., transmission synchronization separator, 2926
Versnel, A., with A. van der Ziel, induced-grid and total-emission noise, 249; noise factor, of grounded-grid valves, 2067, of pentodes for λ 7.25 m, 1240
Vervest, W. L., air-cooling of transmitting valves, 2095; automatic tuning of transmitters, 2941
Verwey, E. J. W., and R. D. Bügel, ceramics with high dielectric constant, 2536
Vick, F. A., with W. Grattidge, Manchester conference on semiconductors, 1097
Victoreen, J. A., electrometer valves for measurement of small currents, 2376
Villard, O. G., Jr, composite a.m. and ph.m., 837; high-power s.s.b. transmitter, 893; tunable a.f. amplifier, 2765
—— with others, Doppler investigation of meteors, 2801
Ville, J., reactive ladder networks, 1887
Vincent, R., with others, 100-kc/s magnetostrictive transducer, 627
Violet, A., approach and landing aids for aircraft, 2238
Violet, F., and J. Riethmuller, oxide cathodes, 2956
Violet, P. G., transformer theory and equivalent circuit, 1872
Vitkevich, V. V., synchronization of relaxation oscillations, 2734
Viman, W. E., with others, electronic mapping of activity of heart or brain, 1741
Vladimir, L. O., image-rejection calculations, 332
Vogan, E. L., with others, horn-aerial radiation patterns, 1599
Voge, J., u.s.w. propagation, 821
Vogel, T., acoustic transparency of rectangular plate, 1564
Vogelman, J. H., self-checking wobbulator, 2005
Voisin, A., with others, construction of metal G-M counters, 2871
Volkers, W. K., high-impedance millivolt measurements above 5 Mc/s, (A)1713
Vollerner, N. F., f.m. of v.f.o., 669
Vol'pert, A. R., radiation resistance of dipole aerial with dielectric envelope, 1294
Vonsovski, S. V., properties of magnetic materials, 1357
de Voogt, A. H., analysis of ionospheric reflections, 1381, 2606
de Vries, H., Brownian movement and hearing, 3010
Vvedenski, B. A., survey of Soviet work on propagation, 1160

W

Wadley, T. L., with others, frequency prediction for Southern Africa, (D)487
Wagener, S., oxide cathodes, emission density and life of, 3593, ionic conductivity of, 1549; temperature of valve electrodes, (D)3302
—— with G. Herrmann, Die Oxydkathode, (B)2985
Wagner, K. W., amplitude and phase distortion, 3392; electrical breakdown of solid insulators, 3446; Operatorenrechnung nebst Anwendungen in Physik and Technik, (B)2827
Wakefield, J. E., metallizing, 754
Wakeman, R. P., converter for u.h.f. television, 2727; indirect microwave relay system, 219
—— with others, television propagation survey for New York metropolitan area, 2353
Wald, S., aerial coupler, 3080; oil-filled miniature variable capacitors, 321
de Walden, S., signal/noise ratio in radar, (D)2042
—— and J. C. Swallow, aural-null and visual methods of d.f. bearing display, 3142
—— and others, naval h.f. c.r. direction finder, 1064
—— with others, aerial systems for h.f. d.f. in ships, 1075
Waldmeier, M., final relative sunspot numbers, for 1947, 700, for 1948, 3414; provisional sunspot numbers, Oct.–Dec. 1947, 375, Jan.–June 1948, 701, July–Sept. 1948, 1037, Oct.–Dec. 1948, 2216, Jan.–March 1949, 3415
Walker, A. C., and G. T. Kohman, growth of EDT crystals, 2530
—— with E. Buehler, synthetic quartz crystals, (A)411
Walker, E. A., ultrasonic location of torpedoes, 2523
—— with others, polar vector indicator, 2589
Walker, R. A., with others, effect of high altitude on speech, 622, on threshold of hearing, 621
Walker, R. C., Photoelectric Cells in Industry, (B)2110
Walker, R. D., Jr, railway track inspection car, 3502
Walker, R. M., analogue computer for solving linear simultaneous equations, (A)1703
Walkinshaw, W., design of linear electron accelerator, 177; waveguides for slow waves, (D)3337
—— with others, travelling-wave linear accelerator for 4-MeV electrons, 1148
Wall, R., with others, mass-spectrometer type leak detector, 408
Wallace, R. L., Jr, with W. E. Kock, coaxial transistor, 2406
Wallis, C. M., circuit analysis for discontinuous waveforms, 323
Wallis, P. R., with E. Parker, 3-dimensional c.r.o. displays, 577, (D)3307
Wallman, H., with G. E. Valley, Jr, Vacuum Tube Amplifiers, (B)1638
Wallmark, T., theory and applications of trochotrons, 2083
Walsh, W. A. G., with others, use of gas-filled tubes for number storage and sending, 2322
Walter, J., radio links on French railways, 2911
Walter, M., with others, mixer stages of coincidence amplifiers, (A)976
Walter, W. Grey, design for an electronic brain, (D)1739
—— H. W. Shipton and W. J. Warren, hum reduction in valves, (D)1241
Walters, G., with others, network analyser, for cases of rotational symmetry, 316, for solution of wave equation, 3066
Wang, C. C., electron beams in axially symmetric fields, (A)1639
Wang, S., with others, ionospheric data, Wuchang, Sept. 1946–Dec. 1947, 716
Ware, L.A., Elements of Electromagnetic Waves, (B)2788
Warncke, H., stereophonic tone-film transmission for halls, 2703
Warnecke, R., v.m. valves, 262
—— and P. Guénard, television and recent developments in u.h.f. valves, (A)904, 1546
—— with others, efficiency of v.m. valves, 1558
Warner, A. J., electrical properties of plastics, 2249
Warnke, G. F., with J. N. Van Scoyoc, direct-coupled amplifier with cross-coupled input circuit, (A)1612
Warren, C. E., with W. L. Davis, calibration of peak voltmeters, 781
Warren, G. W., with others, u.s.w. triode oscillators, (D)338
Warren, W. J., with others, hum reduction in valves, (D)1241
Warshaw, H. D., rotor balancing with electronic capacitor gauge, 3504; spiral chronograph for times up to 12 ms, 133
Wassermann. See Vasserman.
Waterton, F. W., voltmeters for high d.c. voltages, 779
Watkins, E. L., s.s.b. generators, 2479
Watson, D. W., with P. G. Redgment, very long-wave phase differences between spaced aerials, 195
Watson, H. A., graphical analysis of cathode-coupled amplifiers, 676
Watson, R. B., and C. W. Horton, radiation pattern of dielectric rods, 1297, 1602
—— and C. M. McKinney, gain and effective area of horn aerials, 1600
Watson, W. W., with others, ultrasonic modulation of light beam, 2626
Watt, C. S., with R. H. Sloane, negative-ion emission from oxide cathodes, 563
Watton, W. L., and M. E. Pemberton, direct capacitance aircraft altimeter, (A)1126, 2848
Watts, B. N., with C. J. Milner, PbSe photocells, 2072
Watts, H. M., television receivers, front-end design, 2350; transit-time effects in input-circuit design, 3113
Wax, N., properties of tubular electron beams, 2204
—— with J. R. Pierce, filter-type travelling-wave amplifiers, 2668
Waynick, A. H., P. G. Sulzer and E. A. Walker, polar vector indicator, 2589
Webb, W., and R. C. Raymond, current distributions on simple aerials, 2436
—— with R. C. Raymond, radiation resistance of loaded aerials, 2438
Weber, D., with F. Kirschstein, frequency stabilization of f.m. u.s.w. transmitters, 1221
—— with H. Schnitger, self-excited oscillations in travelling-wave valves, 3581
Weber, K. G. B., modulation meter with S-scale, 2858
Weber, W., noise level of high-grade microphones, 3025
Webster, W. M., E. Eberhard and L. E. Barton, circuits for the transistor, 1905
Weekes, K., with R. N. Bracewell, ionospheric absorption, (D)3521
van Weel, A., electrical switching for transceivers, 2908; u.s.w. receiver circuits, 1174
Wegener, H. J., and O. Zinke, attenuation of cm waves in air-space cables, 1273
Weibull, W., sound waves in compressible media, 1565
Weighton, D., impulsive interference in a.m. receivers, (D)503
Weihe, V. I., frequency allocations above 400 Mc/s for aeronautical services, (A)1672
Weijers, T. J., interference of two f.m. transmitters, 2620; recent f.m. developments, 3549
Weil, L., coercive field of powdered Fe/Ni alloys, 1418
Weinstein, L. A., symmetrical waves in open-ended circular waveguides, 1283
Weis, A., effective permeability of premagnetized choke cores, 3171; ferrite h.f. cores, 1065
Weisman, E. K., selected days, mean *K*-indices and preliminary *C*-numbers, July–Sept. 1948, 2220
Weiss, H. G., with others, excitation time of ZnS-Ag phosphor, 108
Weisskopf, V. F., recent developments of electron theory, 3401
Weissman, R., and S. Fox, h.v. supplies for radiation-measuring equipment, (A)1800
Welch, H. W., Jr, space-charge effects and frequency characteristics of c.w. magnetrons, and f.m., (A)1824
Wellinger, R. P., ceramic/metal seals, (A)1681
Wellman, W. R., Elementary Industrial Electronics, (B)2296
Wells, E. M., waveguide modes, 945
Wells, H. W., with L. V. Berkner, Ionospheric Research at Watheroo Observatory, Western Australia, June 1938–June 1946, (B)397
Wells, W., design of Hammond electronic organ, 470; transistor Ge-crystal triode, 265
Wendt, K. R., a.g.c. for television receivers, 352
—— and A. C. Schroeder, a.g.c. for television receivers, 351
Wennerberg, G., v.h.f. direction finder for light aircraft, 3141
Went, J. J., soft iron for cyclotron electromagnet, 2538; thermal expansion of alloys, 1103
Wentz, J. F., and K. D. Smith, microwave television system, 851
Werner, P., with others, transmission of wide a.f. band, 1787
Werner, P. H., disk recording and reproduction, 3328
Werthén, H., and B. Nilsson, automatic impedance meter, 1723
Werthmüller, A., with W. Gerber, short-range fading of broadcasting transmissions, 2036
Wertz, F. D., with L. Camp, low-*Q* magnetostrictive transducer, 3022
West, A. G. D., theatre television in England, 240, 1523
West, C. F., and J. E. DeTurk, digital computer for scientific applications, 1107, (C)3178
West, W., accuracy of measurements by Rayleigh disk, 3008
Westcott, C. H., standing waves and circle diagrams, 2723
—— and F. K. Goward, matching of wide-band aerials and feeders at 500–600 Mc/s, 1596
—— with others, transmission-line impedance measurement, 2264
Weston, J. D., theory of communication, 2321
Weston, W. K., with H. Stanesby, London/Birmingham television cable, 1279, 1857
Whalley, H., and G. J. Scoles, radar observation of heavy rain, 1675
Whalley, W. B., with others, television transmitter for 500–900 Mc/s, 1531
Whatman, A. B., ionosphere observations in Spitsbergen, 2796
Wheeler, H. A., Wheeler monographs, (B)3314
—— and D. Dettinger, measuring efficiency of superheterodyne converter, (A)1713, (B)3314
Wheeler, L. J., contrast expansion, 2171, (C)2753
Wheeler, M. S., resonance-frequency measurement for cavity resonators, 1437
Whelpton, R. V., and P. G. Redgment, c.w. long-range navigation aids, (D)402
Whipple, R. T. P., m.f. d.f. in British Navy, 1065
—— with others, errors in h.f. d.f. bearings due to masts, 1074
White, A. H., with others, semiconducting properties of (Ba,Sr)O, 3444
White, C. F., bridged parallel-T network for suppressed-carrier servo systems, (A)1612; signal generators for servomechanism measurements, 2573
White, E. L., trigger circuit for multi-stage surge generator, 659
White, G., with P. Popper, bridge-type valve voltmeters, 1435
White, J. G., contrast expansion, (D)3086
White, S. Y., experimental ultrasonics, 1842; transistor as amplifier and oscillator, 912; transistor Ge-crystal triode, 265, 581, 582, 913
White, W. C., trends in American valve design, 1827, 2863
White, W. D., techniques for air traffic control, 403; theory of nonsynchronous multiplex systems, (A)1672
White, W. G., c.r. tubes with post-deflection a cceleration, 2397
Whitehead, J. B., measurement of dielectric loss under rising temperature, 769
Whitehead, J. W., balanced-to-unbalanced h.f. matching unit for transmission lines, 1884
Whitfield, H. R., A. Harrison and T. J. Pope, fitting and use of marine radar, 2803
Whitman, M. R., graphical design of iron-core reactors, 973
Whitmer, R. M., fields in nonmetallic waveguides, 17
Wholey, W. B., and W. N. Eldred, new type of slotted-line section, (A)2718
Wiblin, E. R., with R. M. Fishenden, design of Yagi aerials, 1603
Widnall, F., and R. Newbound, protective finishing of electrical equipment, (D)1094
Wiegand, D. E., and W. W. Hansen, 60-c/s hysteresis loop tracer, 772
Wiener, F. M., phase characteristics of capacitor microphones, 630; sound diffraction by rigid disks and square plates, 3000
Wier, A. J., with others, carrier system with 8-kc/s bandwidth, 2905
Wiggin, J. F., with L. C. Downes, shutterless television film projector, 1212
Wiggins, A. M., compliance meter for pickups, 3331
van der Wijck. See van der Wyck.
van Wijk, W. D., with J. A. M. van Liempt, breakdown voltage in rare-gas/nitrogen mixtures, 1972
Wilcock, A., phototelegraphy service to Europe, 1515
Wilcox, R., and H. J. Schlafly, large-screen television demonstration at Philadelphia, 2652
Wilde, H., and G. Bosse, magnetic hysteresis of silicon-iron, 1407
—— and E. Eisele, magnetostrictive acceleration meter, 2867
Wilkes, M. V., EDSAC, calculations with, 3458, design of, 1425, 3459, programme design for, 2823
Wilkins, M. H. F., with G. G. Selman, production of high-intensity ultrasonics for biological applications, 2694
Wilkinson, D. H., the Geiger discharge, 1136
Wilkinson, J. H., automatic computing engine (A.C.E.) at National Physical Laboratory, 1425
Willard, G. W., diffraction of light by ultrasonic beam, 2892; focusing ultrasonic radiators, 3003
Willey, E. J. B., linear resistance-charged gas-relay timebase, 1900
Williams, A. J., Jr, R. R. Tarpley and W. R. Clark, stabilized d.c. amplifier, 2563
—— with others, square-law power-level recorder, 2572
Williams, C., c.w. short-range navigation and landing aids, (D)402
Williams, C. E., with J. A. M. Lyon, alkali-amalgam cathodes for power valves, 2670
Williams, E., valve oscillator circuits, 334
Williams, E. M., and D. F. Aldrich, speed of electronic switching circuits, (A)1612
—— and L. Vallese, wide-deviation f.m. oscillators, 331
—— with P. R. Aigrain, design of amplifiers for optimum transient response, 3104; *n*-reactance network synthesis for desired transient response, 3360; theory of amplitude-stabilized oscillators, 44
Williams, F. C., c.r. tube digit store, 1425, (A)1703
—— and T. Kilburn, charged c.r. tube screens as memory devices in calculating machines, (A)1110, 2258; electronic digital computers, 769
—— and A. M. Uttley, velodyne, (D)2155
—— with others, Electronic Time Measurements, (B)3491; Waveforms, (B)2006
Williams, F. E., design of balanced armature cutter-head, 2131
—— with J. S. Johnson, mechanism of luminescence in phosphors, (D)2867
Williams, M., electrokinetic transducer, 838
Williams, R. W., potentiometers for computing circuits, 782
Williams, S. E., shape of r.f. pulses from sun, 77
Williamson, D. T. N., high-quality amplifier, 3101
Williamson, J. C., with J. D. Kraus, radiation of helical aerials in axial

mode, 843
Willis, E. S., EDT crystal filters, 2468
Willms, W., sound attenuation in absorption tubes, 2695
Wilhoner, G., and F. Tihelka, phase-shift oscillator with wide-range tuning, 45
Willshaw, W. E., with E. C. S. Megaw, naval dm-λ communication equipment, 1516
Willson, A. R., vibration testing of aircraft and equipment, 1737
Wilmotte, R. M., and P. A. Demars, polycast u.h.f. television transmission system, 2056
Wilson, D. G., and R. W. P. King, measurement of aerial impedance using a receiving aerial, (A)2558
Wilson, E. D., optimum performance of semiconductor rectifiers, 2452
Wilson, J. V., with others, attenuation of sound in fog and smoke, 614
Wilson, R. R., with D. R. Corson, particle and quantum counters, 168
Wilson, T. M., with E. F. Travis, r.f. capacitance meter, (A)1713
Wilson, W., electronics in heavy engineering, 3221
Wilson, W. R., with R. C. Nelson, infra-red recording spectrometer, [illegible]
Wilton, R. W., pyrolitic-carbon resistors, 1874
Wilts, C. H., with others, electronic techniques for analogue computers, 3176
Winkler, M. R., control of f.m. transmitter frequency deviation, 3576
Wintergerst, S., permanent-magnet materials, 1416
Wireless World, B.B.C. television field contour map, 1519; British and American television waveform standards, 1206; British standard-frequency transmissions, 134; *Caronia* radio equipment, 1799; Decca radar for small ships, 3432; distortion in reproduction of speech and music, (AD)937; diversity f.m. transmission system, 2912; Eddystone Type 680 receiver, 3530; frequency allocations for European broadcasting stations, 832; G.E.C. Model BRT400 communications receiver, 2310; Kelvin-Hughes marine radar, 1079; Philips Model 681A receiver, 3245; properties and uses of thermistors, 3353; Radio Component Manufacturers' Federation 1949 exhibition, 1912; Redifon Model R50 tropicalized communications receiver, 2899; superheterodyne television unit, 1527, 1811; v.h.f. valves with plane electrodes, 2373; Voigt permanent-magnet loudspeaker, 1573; 1948 amateur radio show, 1015; 1949 Physical Society exhibition, 2198
Wisspeintner, C., operating-parameter theory of filter calculation, 1888
Wittenberg, H. H., thyratrons in radar modulators, 2391
Witzig, W. F., h.f. resistance of coils, 658
Woernley, D. L., with others, ultrasonic modulation of light beam, 2626
Wojtech, H., with H. Kleinwächter, graphical determination of oscillation phenomena, 989
Wolf, E., war-time development of German broadcasting transmitter equipment, 2359
Wolf-Stawski, H., with A. Pascucci, ceramics with high dielectric constant, 1413
Wolff, I., and D. G. C. Luck, f.m. radar applications, [illegible]
—— and others, determination of aircraft ground speed using pulse-Doppler radar, (A)1672
Wolk, B., with H. Jacobs, analysis of gas in cathode-coating assemblies, (A)1824
Wood, R. W., Supersonics—The Science of Inaudible Sounds, (B)1576
Woodburn, J., velocity of sound in superheated steam, 1840
Woodbury, J. W., with others, pulse generator for medical applications, 3097
Woodbury, L. A., M. Nickerson and J. W. Woodbury, pulse generator for medical applications, 3097
Woods, C. H., and others, electromechanical strain-gauge multiplier, (A)1[illegible]
Woodville, G. R., stable voltmeter amplifier, (D)438
Woodward, O. M., Jr, reversible-beam aerial for 12-channel television reception, (A)1578, 2720
Woodward, P. M., and J. D. Lawson, arbitrary polar diagram from source of finite size, 302
Woodward, R. H., model of ionosphere, 386
—— with others, Loran : Long Range Navigation, (B)106
Woodyard, J. R., with others, r.f. system of 184-in. cyclotron, 2016
Woolley, J. C., with others, measurement of resonance frequency of re-radiating structures, 1132; performance of h.f. direction finders in ships, 1063
Woolley, R.v.d.R., source of galactic noise, 80
Woonton, G. A., D. R. Hay and E. L. Vogan, horn-aerial radiation patterns, 1599
Wooster, N., with others, elimination of electrical twinning in quartz, 112
Wooster, W. A., and others, elimination of electrical twinning in quartz, 112
Works, C. N., with T. W. Dakin, microwave dielectric measurements, 2557
Wormell, T. W., and E. T. Pierce, atmospherics, (A)395
Wouk, V., portable h.v. power supply, 2919
Wouters, L. F., with others, r.f. system of 184-in. cyclotron, 2016
Wrathall, E. T., B.B.C./Marconi ribbon microphone Type AXBT, 3024
Wredden, J. H., microscopic examination of enamelled wire, 114
Wright, D. A., emission from oxide cathodes, 2091, 3590
Wright, G. S., with E. M. Ostlund, f.m. broadcasting in U.S.A., 1512
Wright, S. B., with N. Monk, public telephone service on trains, 225
Wwedenski, See Vvedenski.
van der Wyck, C. T. F., modern receiver for radiotelegraphy, 2041; simultaneous reception of signals from several stations on a single aerial, 3535; s.s.b. equipment of Dutch Post Office, (D)1183
Wyke, R. E. B., with others, power diodes, 531
Wylie, F. J., and M. W. Kaye, operational value of shipborne radar, 2803
Wyman, F. E., regenerative frequency divider, 2481
Wyss, H., telephony service for 5th Olympic winter sports, St. Moritz, 1948, 2318

Y

Yabsley, D. E., with others, 50-cm solar radiation during eclipse of 1st Nov. 1948, 3417
Yaffee, P., l.f. synchronized sawtooth generator, (A)1612
Yang, Yo-Han, with R. P. Bien, fluctuation of emission from oxide cathodes, 2090
Yates, F., systematic sampling, 761
Yates, J. G., pulse excitation of impedance bridges, 2271
—— with others, plotting of electron trajectories, 1751
Yeh, Chai, anode/screen-grid space in beam tetrode, 1835
Yeh, Yung-Ching, received power of receiving aerial, 1590
Yensen, T. D., with J. K. Stanley, hiperco, a magnetic alloy, 751
Yo-Han Yang. See Yang, Yo-Han.
Young, A. J., radiators for air-cooled transmitting valves, 2951
Young, J. D., and H. M. Beck, design equations for reactance-valve circuits, 3383
Young, W. R., and L. Y. Lacy, transmission at 450 Mc/s to mobile radio units, (A)1757
—— with D. K. Gannett, frequency and phase swing in f.m. and ph.m. systems transmitting speech, 2048
Yu, Y. P., degenerative regulators, (A)1800; dynamic impedance circuit, 346; peak voltmeter for pulses, 151; regenerative amplifiers, (A)1612, 3386
Yuan, L. C. L., precision h.v. valve voltmeter, 149
Yung-Ching Yeh. See Yeh, Yung-Ching.

Z

Zaalberg van Zelst, J. J., bridge circuit for capacitor microphone, 9
Zade, H. P., with L. Grinstead, r.f. welding of plastics, 3451
Zadeh, L. A., with J. R. Ragazzini, wide-band a.f. phase meter, (A)1713
Zahl, H. A., work of S.C.E.L., 2111
Zakarias, I., reduction of hum in pentodes, 916
Zamsky, J., hysteresis loops on c.r.o., 773
Zartman, I. F., ultrasonic velocities and absorption in gases at low pressures, 2118
Zavales, C. T., with others, application of radar technique to X-ray recording at 150 frames/sec, (A)1733, 2600
Zeidler, H. M., and J. D. Nie, pentriode video amplifiers, 682
Zeitlin, L., with P. Kalantarov, iterative impedance and resonance curve of recurrent circuit, 3087; resonance phenomena in recurrent circuits, 3089
Zeluff, V., television remote viewers, 1216
—— with J. Markus, Handbook of Industrial Electronic Circuits, (B)1245
Zelyakh, E. V., general theory of linear quadripole, 2467
Zenneck, J., with G. Goubau, FIAT Review of German Science 1939–1946: Electronics, incl. Fundamental Emission Phenomena: Part 1, (B)2414
Zepler, E. E., and J. Hekner, triode interelectrode capacitance, 2101
Zeytlenok, G. A., stability of output stages of high-power transmitters, 2346
Zhekulin, L. A., effects of non-uniformity on coaxial cable parameters, 2138
Ziegler, A. W., mechanical development of EDT crystal units, 3485
van der Ziel, A., fluctuations in electrometer circuits, 1123; mixing properties of nonlinear capacitors, 1773; virtual-cathode problem for cylindrical electrodes, 2384
—— and A. Versnel, induced-grid and total-emission noise, 249; noise factor, of grounded-grid valves, 2087, of pentodes for λ 7.25 m, 1246
—— with M. J. O. Strutt, electron-inertia effects in valves, 254, 1233; spontaneous fluctuations in amplifier valves for m and dm waves, 1631; v.m. valves as u.h.f. preamplifiers, (D)3106
Zinchenko, N. S., frequency stability of dynatron-type magnetron oscillations, 259
Zingerman, A. S., statistical method of determining breakdown voltage, 140
Zinke, O., end-fire fed-dipole arrays, 20
—— with H. J. Wegener, attenuation of cm waves in air-space cables, 1273
Zinn, M. K., transient response of f.m. receiver, 1485
Zore, V. A., self-excitation of loaded triode oscillator, 2480
—— with S. D. Gvozdover, dm-λ triode feedback oscillator, 999
Zünti, W., with others, mixer stages of coincidence amplifiers, (A)976
Zuvers, H. E., sealed ignitrons for transmitter power supplies, 556
Zweguintzow, M., with A. Latreille, h.f. telecommunications on power lines, 3540
Zwikker, C., relations between properties of solids, 3162
—— J. van den Eijk and C. W. Kosten, absorption of sound by porous materials, 1569
Zwislocki, J., and E. Lüscher, adaptation of ear to sound stimuli, 2702
Zworykin, V. K., recent progress in television, 1517
—— and E. G. Ramberg, Photoelectricity and its Applications, (B)3603
—— L. E. Flory and W. S. Pike, letter-reading machine for blind, 2590, 2877

* * *

SUBJECT INDEX

SYMBOLS (A) Abstract, (B) Book Review, (C) Note of Correction, (D) Discussion

A

Abacs, for ionospheric control points, 3235
  for r.f. transmission lines, 1274
  technical, (B)1637
  for tension, sag etc. of overhead lines, 3033
Absorption, (See also Ionosphere; Microwaves; Sound)
  acoustic, by felt-covered spheres, 2123, 2419
    in fresh and sea water, 613
    measurement at low frequencies, 936
    by porous materials, 1569, 3017
    by various materials, 7
  atmospheric, of microwaves, 2032
    of mm waves, 1028
  ground, with elevated dipoles, 1864
  h.f., by ionized gases, 71
    in liquids and solids, (A)366, 2244
  ionospheric, 2027, 2305, (D)3521
    and field-strength calculations, 2301
    at vertical incidence, and sun's zenith angle, 2026
  microwave, 456
    of gases, (A)367
    minimum detectable, 693
    of NH_3, pressure broadening in, 3409
    by oxygen, 3410
  space-wave, and large-scale weather conditions, 2037
  spectra, infra-red, of atmospheric gases, 1348, of water vapour, 1349
    microwave, and chemical analysis, 2504
  in supercooled water, for λ 1.25 cm, 2505
  u.h.f., by salt solutions, 1027, 1921
  ultrasonic, in gases at low pressures, 2118
    in liquids, measurement of, 932, by pulse methods, 2697
    in sea water, 612
    in solids, (A)931
    in water, at 0°–80°C, 686, at 1 Mc/s, 3322
Acceleration meter, magnetostrictive, 2867
Acoustics, (See also Absorption; Broadcasting; Impedance; Sound; Ultrasonics)
  applied, recent developments in, 1253
  architectural, of auditoria, 4
    of concert halls, (AD)2124, at Liverpool and Glasgow, 1849, and theatres, Prague, 3015
    c.r.o. reverberation recorder, 6
    c.r.o. reverberation-time measurement, 5, 1265
    variable, 3016
  bibliography, 602, 924, 2114, 2683, 2995
  boundary layer in front of rigid walls, 925
  coupling of cylindrical tube to semi-infinite space, 607
  deadened rooms, design principles, 2699
  interactions between plate and sound field, 605, (C)2117
  measurements by Rayleigh disk, accuracy of, 3008
  parabolic sound concentrators, 276
  transparency of rectangular plate, 1564
  vocal resonators, artificial, experiments with, 3012
Aerial arrays, broadcasting, m.f., design of, 1605
  end-fire, fed-dipole, 20
  with horizontal beams free from side lobes, 2148
  omnidirectional, vertically polarized, 4-element, 952
  radiation patterns of, 1601
—— systems, Adcock, effect of asymmetry, 1293
  gain of, 3057
  for h.f. d.f. in ships, 1075
  ring, 308, (C)1296
Aerials, (See also Couplers; Horns; Lenses, microwave; Transmission lines; Waveguides)
  aids in sketching field-strength diagrams, 3344
  aircraft, receiving, omnidirectional, for 108–122 Mc/s, (A)1578
  arbitrary polar diagram, from source of finite size, 302
  biconical, (D)3341
    ground-plane field of, 3340
    input-impedance calculation by e.m.f. method, 3343
    theory of, 1588
  broadcasting, clover-leaf, high-gain, 2435
    directive, radiation patterns of, 2146
    f.m., multi-V, 1595
  calculation of doubly curved reflectors for shaped beams, 311
  for circular polarization, 2142
  cm-λ, absorption surfaces of, 961
  for controlling non-fading range of broadcasting stations, 647
  coupled, theory of, 960
  cylindrical, with concentric ring of subsidiary radiators, 1865
    infinitely long, 2715
  dielectric-rod, 1604, 3345
    radiation patterns of, 1297, 1602
  diffraction, with axial symmetry, 3049
  dipole, conical, impedance of, 644
    with dielectric envelope, radiation resistance of, 1294
    impedance measurement by reflection method, 2559
    above plane earth, theory of, 951
    radiation from, 950
    radiation impedance and aerial shortening of, 1598
    transmitting, 3055
    vertical, ground-absorption formula for, (C)949
  directive, helical, wide-band, 306
    horn, radiation patterns of, 23
    polar diagrams and gain of, (A)2442
    reversible-beam, for television, (A)1578, 2720
    spaced-loop, 310
    wide-band, u.s.w., (B)2722
    Yagi, design of, 1603
    for 152–162 Mc/s, 1869
  discone, high-gain, 303, for 40–500 Mc/s, 3051
  distribution of current on, 2439, and of charge on, (A)1578, 3047
  elevated-dipole, ground absorption with, 1864
  fan, broad-band, 2437
  feeders for, h.f. balancing devices for, 1314
  flush-mounted, for cars, 1594
  folded-dipole, impedance transformation in, 3342
  frame, measurements on, 2441
  ground, properties of, 962
  helical, end fire, theory of, (A)1578
    impedance of, 650
    radiation in axial mode, 643
    v.h.f., 1860, design of, 1861
  horn, formula for radiation patterns, 1599
    gain and effective area of, 1600
    gain measurement for, 1866
    radiation patterns of, 3053
  impedance of, 1597
    measurement in aircraft, 2270
    measurement using receiving aerial, (A)2558
  inverted-L, λ/4, for trains, 2717
  linear, radiation resistance of, 3054
  loaded, radiation resistance of, 2438
  long, properties of, 1589
  long-wire and horizontal rhombic, polar diagram determination, (B)1300
  manual, (B)964
  maximum directivity of, (D)21, (D)22
  microwave, design of, 1291
    effect of dielectric sheets, 2436
    parabolic, gain formula for, 3056
    using parallel conducting sheets, 1292
    theory and design of, (B)2721
  for multichannel mobile telephony, (A)1578
  multi-slot, 957
  omnidirectional, physical limitations of, 1587
  parallel, centre-driven, mutual impedance of, 1295
    mutual impedance of, 648, (C)1867
  polar diagram measurement for aircraft in flight, (A)307
  power-equalizing network for, 3052
  pylon, f.m., 8-section, for 1200 kW, 304, 864
  radar, rapid scanning for, 1593
  radiation of, general theory, 1859
    phase measurement, 2571
    scattering, 3046
  receiving, formula for current in, 2298
    received power of, 1590
    for Rural Radio Network, 495
    for television, 2718
  rectangular-waveguide, polar diagram of, 2433
  reflectors, cylindroparabolic, design for optimum gain, 1862
  rhombic, design chart, 648, 959
    with feedback, 2714
  with screened down-leads, for interference-free reception, 2624
  sectoral-horn, transmission-line characteristics of, 3043
  slot, elliptical, diffraction pattern for, (A)1578
    off-set from centre of rectangular waveguide, 1586
    potential distribution along, 3044
  slotted-cylinder, polar diagrams of, (A)309, 958
    radiation from, (A)1578
  straight-wire, Hallén's theory for, 953
  surface, theory of, 3048
  television, 955, 956
    for apartment houses, 243
    impedance measurement and matching for, 18
    indoor, 2719
    W.T.V.S., 954
  turnstile, method of feeding, 1298
  u.h.f., 2143
  vertical, with ground planes, impedance measurement for, 2440
  waveguide, channel-section, 2426
    open-ended, 2432
  wide-band, matching with feeders at 500–600 Mc/s, 1596
    for television and f.m. reception, 305, (C)645
Alloys, (See also Ferromagnetic materials; Magnetic materials)
  Fe/Ni, powdered, coercive field of, 1418
  ferromagnetic, structure and properties of Cu_2MnIn, 1956
  magnetic, high-coercivity, containing Nb, 1161, hiperco, 751
  permanent-magnet, anisotropy in, 1958
  pressure and temperature coefficients of resistance of, 3173
  resistance, evanohm, 124

thermal expansion of, 1103
Altimeters, capacitance, (A)1126, 2848
radio, f.m., absolute, 97
Amateur radio, (See also Transmitters; Transmitting stations)
A.R.R.L. handbook, 1948 edition, (B)601, 1949 edition, (B)2682, 1948 French edition, (B)3317
push-pull transmitter, 555
Amplification, in double-beam valves, 2977
microwave, space-charge wave method, 1024, 3406
Amplifiers, a.c., application to optical measurements, 1007
photoelectric, with a.c. galvanometer, 1908
a.f., heater supplies for hum reduction, 677
high-quality, 1845
hum reduction in, (A)2496
miniature, 1341
using Rochelle-salt crystal, 2708
tunable, 2765
very-high-quality, 1003
6-W, Type 6AS7G, 1909
amplitude-selective, 344
aperiodic, theory of, 2484
carrier-frequency, path-time distortion in, 2494
cathode-coupled, graphical analysis of, 676
coaxial, symmetron, 50-kW, for f.m. broadcasting, 2365
compensated, square-wave analysis of, 1626, (C)2192
for conductance bridges, 1907
for counter tubes, 1906
d.c., carrier-type, 3385
design and limitations of, 3384
stabilized, 2563
design for optimum transient response, 3104
direct-coupled, with cross-coupled input circuit, (A)1612
double-stream, (A)1612, 3387
feedback, in cascade, 1009
corrector circuits for, 1013
design of, 3110
nonlinearity in, (D)2200
single-stage, 2495
theory of, (D)1012, 1342
for f.m. broadcasting, 10-kW, 1904
for galvanometer, 2844
grid current and neutralization of, 1831
grounded-anode, sensitivity of, 2188
grounded-grid and grounded-cathode, sensitivity of, 1338
h.f., high-sensitivity, 1903
h.f. and l.f., equivalence of, 675
high-quality, 3101
i.f., radar, design of, (C)3389
subminiature, (A)1612
television, design of, 1635
isolation, decade-gain, 2190
limits of gain at u.h.f., 1332
line, for Paris-Toulouse coaxial cable, 212
linear, Doherty, in American broadcasting, 1343
effect of valve noise on accuracy, 1229
general theory of, 2187
magnetic, (See also Transductors) 314, (A)971, 2450, 2728, 3065, 3350
amplistat, 3352
analysis and applications of, 313
bibliography on, 2451
effect of core materials on design, 2449
with feedback, 2731, analysis of, (A)2448, 3064
without feedback, analysis of, (A)2447, 3351
push-pull, design of, 1873
series-connected, 2729
simplified, 315, (D)1304
theory of, 656, 2730
for warships, [illegible]
negative-feedback, 1910, (D)2196, (D)2768, (D)3111
design formulae, 56
overall amplification of, 2195
network representation of admittances, 2194
permissible nonlinear distortion in, 3107
power, for Citizens' transmitter, 1006
grounded-grid, 2763
RC, design of, 1628
reactive-feedback, influence on galvanometer response, 1014
regenerative, (A)1612, 3386
see-saw or anode follower, 678
for square-wave signals, 1340
stabilizing, for television, 3114
stable, for voltmeter, (D)438
stagger-tuned, design formulae for, 2193
phase-distortion reduction in, 681
subminiature, design techniques for, 2490
superregenerative, theory of, 1627, (C)2488
synthesis by means of conformal transformations, (A)1612
transmitter, wide-band, h.f., (A)674
transistor, 912
travelling-wave, filter-type, 2668
tuned, response to gliding tone, 2473
5-c/s, for use with thermocouples, 2766
u.h.f., v.m. valves as, (D)3106
u.s.w., problems of, 1629
valve, (B)1638
v.h.f. double-beam, 2977, analysis for, 1540, design and construction of, 2487, 3388, solution of equation for, (A)1824, theory of, 1583, 1825, 2486, (D)3300
video, cathode-compensated, 2771
cathode-neutralized, 3393
pentriode, 682
stagger-peaked, 1344
testing with square-wave generator, 3099
transient response of, 3395
wide-band, with distributed amplification, 1339, 2485
l.f. amplification in, 3109
transient response of, 3105
for 100 c/s to 20 Mc/s, 3103
Analogies, between angle-of-incidence and frequency problems, 3400
between waveguide e.m. fields and elastic-membrane vibrations, 3040
Analyser, distribution, for impulse lengths, 132
network, for e.m. field problems, 316, 3066
for network response characteristics, 1128
Analysis, (See also Circuit analysis; Network analysis; Waveform analysis)
dimensional, electrical applications of, 60
Anemometer, hot-wire, compensated, 2586
Atmosphere, (See also Ionosphere; Stratosphere; Troposphere)
conductivity at Huancayo, 721
currents at 120 km height, 1932
ionization in, 1378
low-level radio ducts in, 1167
lower, diffusion in, 1667
ionic equilibrium of, 2225
radar reflections from, 1761, 2300
sea-breeze structure, 1668
luminescence of, 1936
lunar tidal motions in, 1382
oxygen/nitrogen, photochemical processes in, 1376
photochemistry of oxygen in, 1377
potential gradient, 1055
radar study of, 2526
stratified, refractive-index profile deduced from radio observations, 2025
structure of temperature field in turbulent stream, 1928
temperature at tropopause and of lower stratosphere, 3137
upper, atomic-O zone, ionized layers, and radiation, 1929
atomic oxygen in, 1379, vertical distribution of, 2224
wind and temperature measurements up to 30 km, 3428
Atmospheric electricity, airspeed and precipitation charging, 2622
during disturbed weather, (A)394
fundamental problem of, 3138
Atmospherics, location of, [illegible]
measurement of, 2276
propagation of, 1389
recording on s.s. *Commandant Charcot*, 3429
waveform of, (A)395
Attenuation, of cm waves, in air-space cables, 1273, by electron beam, 3382
of short waves in ionosphere, 1165
Attenuators, calculation of, 983
coaxial, for 4–10 kMc/s, 348
microwave, broad-band, (A)1713
materials for, 1691, 2535
standard, (A)1730, 2578
Audiometer, direct-reading, 3325
Aurora, displays at Saskatoon, Jan./Feb. 1949, 2522
heights of various forms, South Norway, 724
3000-Mc/s radiation from, 3139

B

Barium titanate, dielectric behaviour of, 745, 746
as electromechanical transducer, 3439
and other Ti compounds, refractive index of, 2534
piezoelectric properties of, 1087
single crystals, production and properties of, 1689
single-domain crystals, properties of, 1963
Batteries, dry, using Mg, 532, 533
Vidor Kalium, 230
h.v., Zamboni pile, 862
Beacons. See Navigation aids.
Betatrons. See Particle accelerators.
Blind, letter-reading machine for, 2593, 2877
Blind landing, courses independent of weather conditions, 102, 1081
and homing systems, for naval aircraft, 99
Bolometers, microwave, broad-band, 3205, efficiency of, 3471
Book notices and reviews,
Advances in Electronics, 2889
Antenna Manual, 964
Applied Electronics, 2295
Atti del Congresso internazionale per il Cinquantenario della Scoperta Marconiana della Radio, 598
Basic Mathematics for Radio, 423
B.I.O.S. Final Report No. 724, Electronic Principles as applied in Germany to the testing of Materials, 2819
B.I.O.S. Final Report No. 725, German Research on Rectifiers and Semi-Conductors, 2922
B.I.O.S. Final Report No. 866, High-Frequency Heating, 2888
B.I.O.S. Final Report No. 1198, Industrial Electronic Control, 2887
B.I.O.S. Final Report No. 1228, H.F. Instruments and Measuring Techniques, 2865
B.I.O.S. Final Report No. 1679, Ultrasonic Material Testing and Other Applications, 1461
B.I.O.S. Final Report No. 1746, German Development of Modulator Valves for Radar Applications, 2984
B.I.O.S. Final Report No. 1751, German Research on Semi-Conductors Metal Rectifiers, Detectors and Photocells, 1700
B.I.O.S. Final Report No. 1834, Production and Use of Getter Materials in German Radio Valves, Thermionic Devices generally, and Electric Lamps, 1105
B.I.O.S. Final Report No. 1844, Some Aspects of German Soldering, Brazing and Welding Methods, 2253
B.I.O.S. Miscellaneous Report No. 77, European Electron Induction Accelerators, 2891
B.I.O.S. Miscellaneous Report No. 83, on frequency and phase modulation, 2916
B.I.O.S. Miscellaneous Report No. 102, Dutch Report on Transmitting Tube Targets in Germany, 586
Breitband-Richtstrahlantennen mit Anpassvierpolen für Ultrakurzwellen, 2722
Cathode Ray Tube Displays, 3601
The Cathode-Ray Tube and Typical Applications, 587
Commonwealth Specialist Conference on Radio Research, London, 1948, 2994
Components Handbook, 3115
Dictionnaire de Radiotechnique, 599
Earth Conduction Effects in Transmission Systems, 3554
Electromagnetism, 75
Electromechanical Transducers and Wave Filters, 2712
Electronic Time Measurements, 3491
Electronics, 2890
Electronics and their Application in Industry and Research, 3516
Elektrische Kippschwingungen, 2773
Elektrische Wellen, 1562
Elektronenstrahloszillographen, 2280
Elementary Industrial Electronics, 2296
Elements of Electromagnetic Waves, 2788
Essentials of Radio, 272
F.I.A.T. Final Report No. 865 (Supplement), Six Papers on Television, 1819
F.I.A.T. Final Report No. 892, Ceramic Dielectrics for Condensers, 2821
F.I.A.T. Final Report No. 1027, The Krawinkel Image-Storing Cathode-Ray Tube, 2986
F.I.A.T. Final Report No. 1098, Etch and Percussion Figures, and Twinning of Quartz, 2818
F.I.A.T. Review of German Science, 1939–1946: Electronics, incl. Fundamental Emission Phenomena: Part 1, 2414
Five-Figure Tables of Natural Trigonometrical Functions, 1709
Frequency Analysis, Modulation and Noise, 2007
Frequency Modulation, Vol. 1, 529
Fundamentals of Electric Waves, 1838
Fundamentals of Electrical Engineering, 922
Graphical Symbols for Telecommunications, 664
Handbook of Industrial Electronic Circuits, 1345
High Frequency Measuring Techniques using Transmission Lines, 2866
Industrial Electronics Reference Book, 1753
Instrument Manual, 3318
International Radio Regulations, 1192
An Introduction to the Laplace Transformation, 3182
Ionospheric Radio Propagation, 824
Ionospheric Research at Watheroo Observatory, Western Australia, June 1938–June 1946, 397
Lehrbuch der Funkempfangstechnik, 2904
Loran: Long Range Navigation, 106
Magnetic Recording, 3332
Metal Rectifiers, 3269
A Method of Determining the Polar Diagrams of Long-Wire and Horizontal Rhombic Aerials, 1300
Microwave Antenna Theory and Design, 2721
Microwave Duplexers, 354
Microwave Magnetrons, 588
Microwave Receivers, 206
Microwave Transmission Circuits, 1016
Microwaves and Radar Electronics, 3152
Modern Operational Calculus with Applications in Technical Mathematics, 1428
Modern Radio Technique, 3602
Most-Often-Needed 1949 Radio Diagrams and Servicing Information, 2317
Operatorenrechnung nebst Anwendungen in Physik und Technik, 2827
Outline of Radio, 3604
Die Oxydkathode, 2985
Photoelectric Cells in Industry, 2110
Photoelectricity and its Applications, 3600
Practical Disk Recording, 1577
Practical Five-Figure Mathematical Tables, 1981
Principes Fondamentaux de Télévision, 1218
Principles of Microwave Circuits, 1636
Principles and Practice of Radar, 3150
Principles of Servomechanisms, 2821
Pulse Generators, 917
Pulses and Transients in Communication Circuits, 2772
Radar Aids to Navigation, 1083
Radar Primer, 2239
Radar: What Radar Is and How It Works, 407
Radio Amateur's Handbook, 601, 2682, French edition, 3317
Radio Engineering, 600
Radio Laboratory Handbook, 3492
Radio Research Special Report No. 18, Application of Ionospheric Data to Radio Communication, 825
Radio Servicing: Theory and Practice, 3396
Radio at Ultra-High Frequencies: Vol. 2, 923
Radio Valve Data, 2409
Radio Wave Propagation: N.D.R.C. report, 3528
R.C.A. Air-Cooled Transmitting Tubes: Technical Manual TT3, 2983
R.C.A. Receiving-Tube Manual, Technical Series RC15, 2982
Report of Royal Society Empire Scientific Conference, 597
Reports on German and Japanese Industry, Classified List No. 18, 267
Reports on Progress in Physics, Vol. 11, 1946–47, 368
The Royal Society Scientific Information Conference, 1948, Report, 919
Scientific Foundations of Vacuum Technique, 3174
Spherical Harmonics, 3181
Standard Valves, 2078
Supersonics—The Science of Inaudible Sounds, 1576
Tables of the Bessel Functions of the First Kind, 1708
Tables of Bessel Functions of Fractional Order: Vol. 1, 1980
Tables of Generalized Sine and Cosine Integral Functions, 3462
Tables of Physical and Chemical Constants, 1922
Tafeln elementarer Funktionen, 2828
Tafeln höherer Funktionen, 2826
Techniques in Experimental Electronics, 2297
Technische Nomogramme, 1637
Television, 2357
Television and F.M. Receiver Servicing, 511
Television Receiver Construction, 2358
Terrestrial Radio Waves, 3242
A Textbook of Radar, 3151
Theory of Servomechanisms, 232
Ultrasonics, 3032
Vacuum Tube Circuits, 355
Vacuum Tube Amplifiers, 1638
Velocity-Modulated Thermionic Tubes, 1249
Vibration and Sound, 279, 1575
The War History of the Radio Branch, 3153
Waveforms, 2006
Wheeler Monographs, 3314
Brain, electronic, design for, 1144, (D)1739, 2011
Breakdown, (See also Dielectrics; Insulating materials)
electrical, of solid insulators, 3446
in gases, electrical and optical phenomena, 1918
at h.f., (A) 361
of gases, liquids and solids, theory of, 1023
of solid insulating materials, 1100
spark, c.r.o. observations at u.h.f., 1643
—— **strength,** of air at u.h.f., 2246, between coaxial cylinders, 690
of liquids, for short voltage pulses, 1694
—— **voltage,** of paper-dielectric capacitors, 748
in rare-gas/nitrogen mixtures, 1972
spark, in air, 3122
statistical method of determination, 140
Bridges, a.c., double-ratio, with inductively coupled ratio arms, (A)1126, 2850
for measurement of L and *k*, 3188
bolometer, for microwave power measurement, 2565
capacitance, precision, design of, 2847, self-balancing, 785
capacitance/conductance, wide-range, 2846
conductance, sensitive amplifier for, 1907
impedance, microwave, 2566, null detectors for, 784
Maxwell, at low frequencies, 2849
pulse excitation of, 2271
thermistor, for r.f. power measurement, 441
transmission-line, (D)442
waveguide, for measuring gain at 4000 Mc/s, 786
Wheatstone, galvanometer connection for maximum sensitivity, 152
Broadcasting, (See also Aerials; Modulation; Radio links; Relay systems)
arrangements for Olympic Games, 522
B.B.C. war-time activities, (D)526, (D)2915
f.m., in Australia, 2638
Rural Radio Network programme development, 596
in U.S.A., 1512
frequency allocations for European stations, 832, 1181
in Germany, developments since 1923, 2639
of orchestral music, 3019
stratovision tests in U.S.A., 233
synchronization in, 527
wire, acoustic quality in, 2424
at 5th Olympic winter sports, St. Moritz, 1948, 2328
—— **stations,** B.B.C., unattended, low-power, 223
control room design, 2050
Copenhagen, 222
f.m., monitor for, 449
NWDR, in Germany, 593
Sottens, 1821
s.w., Allouis OCII, 1190
B.B.C., at Skelton, Cumberland, 1794
—— **studios,** European, new developments, (A)1563
KOMO, construction of, 1187, equipment for, 1188, heating and ventilation of, 1189, planning of, 1186
radio and television, planning of, 1795
—— **systems,** f.m., advantages of circular polarization, 528
Rural Radio Network, 523, 594, 595, 839
pulse-time u.h.f. multiplex, 2629
Brownian movement, 61

C

Cables, air-space, attenuation of cm waves in, 1273
coaxial, 3034
attenuation and phase distortion in, 14
effects of nonuniformity, 2138
faults in, test sets for, 431
h.f., pulse measurement of impedance irregularities in, 142, 282, 790, 1724
with high characteristic impedance, 1278
for television, London/Birmingham, 1279, 1857
Philadelphia/Pittsburgh/Cleveland, 1581
transition to helix, (A)1578
concentric, wave propagation in, 13
fault clearance using special valve, 559
fault-finding, by de Sauty bridge, 283, test equipment for, 3189
high-impedance, 2137
lead-sheathed, continuous lead-extrusion machine for, 2247
l.v., fault location on, 281
telecommunication, developments since 1924, 1276
long-distance, laying of, 1277
transmission constants, determination of, 1990
underground, fault-finding in, 280, 286, (D)287, 288, by ground vibration, 289
Calculating machines, analogue, (A)1703
Anacom, 2547
design of, 1979
differential analyser applications, 3457
electrical potential analyser, 1707
electronic, 1704, 2824, method for multiplication and division, 1977
isograph for solving equations, (A)1703
solution of partial differential equations by, 3460
stability criterion for, 3348
for tenth degree algebraic equations, 2548
Westinghouse and California Institute of Technology machines, 2546, 3176
analogue and digital, electronic, applications of, 2886
c.r. tube for digit storage, (A)1110, 1425, (A)1763, 2256
differential analyser, Bush-Caldwell, 129

electronic, 758, (A)1703
technique for, 1109
digital, all-purpose, design of, 1425
Binac, test results for, (A)1703
design progress, 3459
dynamically regenerated memory tube for, (A)1703
EDSAC, design of, 1425, 2823, typical use of, 3458
electronic, 759, 2257, A.C.E. at N.P.L., 1425, IBM Type 604, (A)1703
Eniac and projected French machine, 130
high-speed, 3177
historical survey of, 1425
IBM selective-sequence, (A)2545
magnetic storage system for, 3179
Mark III computer, (A)1703
programme design for, 2823
Royal Society discussion, (AD)128
for scientific applications, 1107, (C)3178
switching circuits for, 418
electromechanical and electronic, 2544
electronic, (A)419
integrators, Bush, connections for, 1108
for linear differential equations with constant coefficients, 1424
network for determining eigenvalues of matrix, 131
number storage on magnetic tape, 421
parametric electronic computer, (A)1703
programming for playing chess, (A)1703
recent projects, 1425
for solving simultaneous equations, 420, 760, (A)1703, 1705, 1978
Cameras, (See also Television)
for c.r.o., 1201
Capacitance measurement, interelectrode, for valves, 2102
meter, for electrolytic capacitors, 2834
r.f., (A)1713
standard, low-value, 2550
Capacitors, air-dielectric, effect of humidity on, 978, 1611
ceramic, 2162
ceramic dielectrics for, (B)2821
electrolytic, climatization of, 1967
3-ammeter measurement method for, 3465
German, 663
metal-cylinder, temperature-compensated, 1880
nonlinear, frequency-mixing properties of, 1773
paper, breakdown voltage of, 748, and theory of extreme values, 1308,
using chlorinated impregnants, 3072
impregnated with semiconducting liquids, 1969
resonances in, 2161
standard, 160
surge-resistance measurements for, 2556
titanate, cyclic variation of capacitance, 322
4-terminal, applications of, (A)1612
variable, miniature, oil-filled, 321
wide-range, 0.01–10 pF, 2564
Carrier-current systems, equipment maintenance measurements, 1986
for overhead lines, 1497, 12-channel, L.T.T., 2046
for power lines, 213, 3540, s.s.b., 834, 2630
for rural service, 829, 830
signal-level regulator for, 2332
test equipment for, 1127
wide-band, 514
12-channel, in South Africa, 3539
48-channel, 3251
with 8-kc/s bandwidth, 2905, delay equalization for, 2906
150-kc/s, for radio relay circuits, 2637
Cathode follower, as d.c. potential divider, 1004
design for r.f., 3102
transient response of, 2489
Cathode-ray oscillographs, (B)2280
with circular timebase, 2854
with cylindrical screen, 1551
new types, (A)443
for short-time measurement, 444
specifications for, (A)1713
3-beam, for frequencies to 10 kMc/s, 2000
with 100-Mc/s bandwidth, (A)2568
—— **oscillography**, photographic techniques in, (A)1800
—— **oscilloscope**, panoramic display technique, 154
vector voltage indicator, 2569, 2853
wide-band, 50-Mc/s, (A)1713
—— **tubes**, and applications, (B)587
applications in photography and optics, (A)2596, 3226
beam-deflection, for p.c.m., 576
for comparison of 1-kc/s sub-standard tones, 3194
developments in Germany, 1939–1946, 2368
for digit storage, (A)1110, 1425
display methods, (B)3601
high-power, 3308
image-storage, graphechon, (A)1810, 2061, 2928
Krawinkel, (B)2986
luminescent screens for, (A)445
metal, envelope design for, (A)1824
16-in., for television, 575, 2399
negative-ion blemish in, 1243
physics of screen materials, 3158
with post-deflection acceleration, 2397
for projection television receiver, 1836
television, mass-production techniques for, (A)2678
3-dimensional displays, 577, 1242, 2459, 3305, (D)3307
Cathodes, (See also Electron emission)
alkali-amalgam, for power valves, 2670
cold, effect of Ba compounds, (A)1824
high-emission, 1231
oxide, activation mechanism for, 3587
analysis of gas from, (A)1824
core-material tests, 2674, standard diode for, 2675
and diode operation for small signals, (A)1824
effect of BaS on emission, 3591
emission from, 2091, 3590, effect of gases and vapours, 2955, fluctuation of, 2090, mechanism of, 253
emission constant and apparent work function, 562
emission microscope for, 3486
experimental investigation of, 2956
ionic conductivity of, 1549
negative-ion emission from, 563
physical principles of, (B)2985
poisoning of, 1548, 3589
production of free Ba by, 2957
pulse emission decay in, 2671
resistance of BaO and SrO coatings for high pulse emission, 2093
reversible oxygen-poisoning of, 3588
secondary-emission effects, (A)1824
semiconducting properties of (Ba,Sr)O, 3444
use of radioactive elements for study of, 3592
work functions and conductivity of, 2094
sintered thoria/tungsten, emission of, 3585
thoria, emissivity of, 1546
Charts, impedance, for h.f. transmission lines, 3045
for propagation constants of cables, 1580
and radar chart matching devices, 2803
for rectifier filters, (A)1612
Chemical analysis, use of microwave absorption spectra, 2504
Circle diagrams, 2723
Circuit analysis, for gas-valve rectifiers, 323
—— **design**, using G-curves, (A)1612
—— **theory**, (See also Networks)
effective and circuit bandwidths, (A)3074
gyrator, new circuit element, 960, 3075
high-pass filter function, 966
Miller effect, 3076
network transformations, 32
optimum response to Heaviside pulse, 3363
for oscillating diode in transit-time region, 998
pulling of oscillations, 34
response curve of quadripole, 40
response of linear resonant systems, 671, (C)1325
signals with limited spectra, 3069
transient distortion in networks, (A)652
transient response of linear systems, 651, of nonlinear systems, 312
trapezoidal waveform with minimum distortion, (D)1302
Circuits, (See also Filters; Networks)
a.g.c., for television receivers, 351, 352
amplifier, i.f., properties of, 1002
negative-feedback, as variable impedance, 346
parameters of, 2762
bridge, for capacitor microphone, 9
cathode-follower, with cathode tap, (A)345
clipper, cathode-coupled, 198
coincidence, with high resolving power, 974
with medium resolution, 975
counter, pulse-amplitude discriminator, 1877
coupled, h.f. and m.f., graphical design methods, 673
initial effects in, 43
phase distortion in, 1328
triple-tuned, analysis of, (A)1612
tuned, graphical analysis of, 3377, parabolic loci for, 672
and u.h.f. f.m., 2475
delay, phantastron, 2167
diode, analysis of, 2151, graphical analysis of, 2152
distributed-constant, impedance-function theory for, 1868
dual, 33
electronic, industrial, handbook of, (B)1345
with e.m. coupling, 2174
equivalent, for piezoelectric acoustic receiver, 3020
for transformers, 1613
f.m., calculations for, 1883
input, design of, 584
phase-inverter, cross-coupled, 2446
integrating, Miller, 347
linear varying-parameter and nonlinear, analysis for, (A)1612
LRC, calculation of transients by step-by-step integration, 2465
microwave, principles of, (B)1636
mixing, for coincidence amplifiers, (A)976
multiplying, and wattmeters, 3361
negative-resistance, graphical methods for, 1323, theory of, 1542
nonlinear, operational analysis of, 3077
oscillatory, periodic and non-periodic phenomena in, 1701
resonance phenomena in, 3376
response to gliding tone, 670
temperature compensation of, 2754
transient response of, 3090
peak-selector, (A)1612
positive-feedback, for miniature equipment, 3112
potted, use of casting resin, 3441
printed, manufacture of, 197
quench, for G-M counters, 2457
reactance-modulator, design equations for, 3383
receiver, dm-λ, amplifier and mixer, sensitivity of, 2312
recurrent, iterative impedance and resonance curve of, 3087
resonance phenomena in, 3089
scaling-down, 977, 2159
see-saw or anode-follower, 678
series-capacitor, for valve heaters, 564
smoothing, RC, 3371
stagger-tuned, calculation of, 2769
sweep, (A)1612
switching, 2-terminal, synthesis by means of Boolean algebra, 2456
transmission, microwave, (B)1016
trigger, high-speed, 2160
for multi-stage surge generator, 659
reactive, 2739
triggered, spurious signals due to noise, 1777
triode, matrix technique for, (D)2168
tuned, image rejection calculations, 332
valve, (B)355, basic, sensitivity limit of, 3362
valve-oscillator, 334
Classification system, Universal Decimal, 268
Climatization, (See also Protection)
of electrolytic capacitors, 1967
of radio equipment, 1966
Clocks, atomic, 1983, 2549
quartz-crystal, 1112, 1113, (C)3183, evolution of, 762
Coils, choke, effective permeability of premagnetized cores, 29, 3171
circular, approximate inductance formulae for, 3356
dust-core, h.f., design of, 2736
h.f. resistance of, 658
i.f., television, design chart for, 2737
inductance, without iron, axial field and losses of, 1876
with laminated-iron cores, distortion in, 2738
multi-layer, calculation of mutual inductance, 319
progressive and universal, design of, (D)3390
Pupin, developments since 1924, 1276, hysteresis distortion in, 1168
single-layer, Q calculation for, 1306
solenoid, single-layer, inductance calculation using Bessel functions, 2157, screened, inductance of, 2158
Comets, in 1947, 1032
Communication, theory of, 62, 2321
elementary, 2320
mathematical, 1361
in presence of noise, 1649, 2319
statistical, (A)1785
—— **equipment**, (See also Receivers; Transmitters)
airborne, Type A.R.I. 5272, 1511
dm-λ, naval, 1510
mobile, 3260, amateur, 28-Mc/s, 3261, Australian, 1191, compact unit, 227, for remote pickups, 2913
terminal, for u.h.f. pulse-time multiplex system, (A)2828
—— **systems**, (See also Carrier-current systems; Radio links; Radiotelegraphy; Radiotelephony; Telephony; Relay systems)
auto-telegraph, international, 210, radio link design for, 211
f.m., negative feedback in, 3548
transatlantic, 518, 1506
long-distance, commercial, 3252
military, future requirements, 831
mobile, adjacent-channel operation of, 2914
citizens' R/T service, 517
using diversity f.m. transmission, 2912
F.C.C. frequency allocations and rules, 2907
New York State police radio, 524
R/T, 6-channel, (A)1785
v.h.f., multi-carrier, police, 228, for vehicles, 1797
multiplex, comparison of, (A)1785
nonsynchronous, theory of, (A)1672
p.c.m., 516
p.t.m. and p.f.m., 1790
p.m., crosstalk in, 224
theoretical analysis of, 515
time-sharing, 3546
u.s.w., 3543, development work in Switzerland, 3544, use of frequency filters in, 3545
in petroleum industry, 1783
with ph.m. and f.m., 2048
p.c.m., interference-free, 3551
signal/noise ratio in, 3552
pulse-count modulation, distortion in, (A)1785
pulse-f.m., noise in, 1778
p.m., (D)1184, 2324
narrow band, amateur, 2909
transmission efficiency and Hartley law, 2045
p.t.m., interference characteristics of, (A)1785
radio, developments in Great Britain, 1498
for railways, 1509, v.h.f., 226
using reflected power, 521
time-division, multiplex, 3258, crosstalk in, (A)1785
voice-controlled, 3541
Commutation, in rectifiers using relay tubes, 2063
Compass, magnetic, with c.r. sensing element, 799
Components, for broadcast receivers, selection tests, (D)453, (A)796
climatic and durability tests, specification RIC/11 for, 2279
coaxial, for u.h.f. measurements, 437
handbook, (B)3115
radio, new, in world market, 2770
radio industry's activities, (D)353
R.C.M.F. exhibition, 1949, 1912
standardization, work of A.S.E.S.A., 2445
u.h.f., standardized, 1633
war-time developments of, (D)353
Conferences and conventions, A.I.E.E., electronic instrumentation, 2018; A.I.E.E., h.f. measurements, 1985; A.I.E.E., valves, 1948, 2066; A.S.T.M. 1948, magnetic testing, (A)3467; British Association, magnetism, 1025; British Commonwealth Specialist, on Radio Research, London, 1948, (B)2994; C.C.I.F., 1948, Stockholm, 920; C.C.I.R., 1948, Stockholm, 921, 3253; C.C.I.T., Brussels, May 1948, 271; electron microscopy, Cambridge, Sept. 1948, 1749, 2882, Delft, 3513, London 1948, 474; electronics in industry, 1145; European broadcasting, Copenhagen, 832, 3254; international, acoustics, London, 1948, 2115, radio, 1948, 2411, Telecommunications, Atlantic City, 1947, 1499; I.T.U. council, 3rd session of, 3250, 3603; luminescence, Moscow 1948, 2202; Marconi radio jubilee, Rome, 1947, (B)598; maritime regional radio communication, Copenhagen, 3255; Physical Society, on ionosphere and e.m. wave propagation, 3522; Physical Society symposium on sound transmission and noise, 604; powder metallurgy, Graz, 1948, 123, 753; Royal Society, Empire Scientific, 1946, (B)597, Scientific Information, 590; semiconductors, Manchester, 1097; servomechanisms, London, 1947, 858; television, Paris 1948, 865, 866, 3560; television, Zurich, 1948, 867
Conformal representation, application to e.m. fields, 1645
Constants, physical and chemical, tables of, (B)1922
Contact resistance, variation with current, 3121
Control, (See also Circuits; Frequency control; Servomechanisms; Telecontrol)
automatic, of aircraft, 1680
photoelectric, of furnace temperature, 2581
industrial, German electronic methods, (B)2887
phase-shift, for auxiliary circuit supplies, 972
process, automatic, 3503
register, in printing, 808
synchronous, of clocks by crystal oscillator, 2831
Convectron, dynamic vertical-sensing element, 455
Converters, d.c./a.c., thyratron, 3263
superheterodyne, efficiency of, (A)1713
for u.h.f. television, 2727
v.hf.., low-noise, 3536
Cores, dust, Ni-Fe alloy, 122
sheet-metal, permeability and eddy currents at v.h.f., 2806
Corona, at high altitudes, and radio interference, 363
influence on design of h.v. apparatus, 70
point-to-plane, impulse, 2499, onset potential of, 3405
Corrosion, of buried cables, 920
Cosmic noise, (A)372, 2218
from Cassiopeia and Cygnus, 702
from galaxy, r.f., 377, 1367, 2509, source of, 80, 2217, spectrum of, 1366
Cosmology, review of, 1029
Counters, coincidence, high-resolution, 166
high-speed, for multipliers, 167
crystal, 2506, 2507
diamond, removal of space charge in, 3215
G-M, 3211
adjustable, experiments with, 1443
argon-alcohol, effect of external quenching on life, 2874
temperature effect in, (A)1140
γ-ray, efficiency increase for, 2873, 3214
demountable, using helium/ether mixture, 3496
design for high counting rates, (A)1733
discharge phenomena in, 1136
discharge spread in, 162, 163
efficiency of, 461
ethylene-filled, 164
with external cathode, 3212
fluctuation problems for, 1138
h.v. supplies for, 1195
measurement of dead-time in, 1445, 2583
mechanism of, 1137
metal, construction of, 2871
methane-filled, deterioration of, 801
multicellular, 2872
operation of, 3497
portable, for drill holes, 3498
quench circuit for, 320, 2457
recent research, 1444
reduction of dead-time in, 1135
rejuvenation of, 2870
self-quenching, characteristics of, 3495, life of, 800, measurements on, 1139, dead-time reduction in, 165
G-M and proportional, spherical, 462
for investigation of metal surfaces, 3213
particle and quantum, 168
proportional, for β-ray detection, (A)1733
pulse, 660, 2285, 2740, 3357
scaling-down circuits for, 977, 2159
scintillation, 2582
photomultiplier type, 460
use of Type 931-A electron multipliers in, 1446
Couplers, aerial, variable, 3080
directional, reflectometer, 1729
for transmission lines, (C)2434
for waveguide, theory of, 2169
electronic, for coupling many receivers to one aerial, (A)1612
Crystals, (See also Piezoelectric crystals; Quartz)
as counters, 2506, 2507
EDT, 2529, development of, 3435, growth of, 2530
mixer, performance of, (A)1769
piezoelectric, wave propagation in, 2201
Rochelle salt, use in telephony equipment, 2708
Cyclotrons. See Particle accelerators.

D

Delay lines, magnetostrictive, (A)1578
mercury, for computer memory unit, 3082
ultrasonic, improved, 2747
Demodulation, distortionless, of s.s.b. signals, 2615
general theory, 2482
Demodulator, for f.m. and ph.m., 1170
Depth sounder, Type PE K 3G, 2800
Detection, superregenerative, theory of, 498
Detectors, 2330
crystal, 2780
f.m., limiter-discriminator, in presence of impulse noise, 500
German research on, (B)1700
ratio, f.m., 2775
Diamond, theory of bombardment conductivity of, 1648
Diathermy, applications of cm and dm waves, 1742
F.C.C. unit for, 2587
Dictionary, radio, French-English-German, (B)599
Dielectric constant, of ceramics, at 100 Mc/s and high temperature, 3466
of gases, 764
measurement using resonant cavity, 1434
of insulators at u.h.f., 118
of liquids, accurate measurement of, 3130
measurement in waveguides, 1443
of solids at microwave frequencies, 1717
of solutions at h.f., 1432
—— **loss** measurement, with rising temperature, 769
—— **properties**, of Ba/Mg titanate, 414
of BaTiO$_3$ single-domain crystals, 1963
of BaTiO$_3$/SrTiO$_3$ mixtures at 10 kMc/s, 1093
of cellulose impregnated with semiconductor, 747
of ceramics and glasses at cm λ and 20°–400°C, 2248
of ice, 3191, at λ 1.25 cm, 2532
of insulators at 750 Mc/s, 119
measurement by balance methods, 1431

of $MgTiO_3$ ceramics, 1414
microwave, of human body, 2282
of semiconductors at u.h.f., 1119
of solids at cm λ, 1989, 2557
of titanates at u.h.f., 1092
Diffraction, (See also Electromagnetic theory; Sound; Wave propagation; Waves)
approximate methods of calculation for, 817
asymptotic treatment of, 3119
of e.m. waves, by plane screen, 3124
by wire grid, 1754
of light by ultrasonic beam, 2692
of plane waves, by black screens, 2779
by semi-infinite conducting sheets, 3229
of sound, through circular aperture, 2690
by circular disk, 3001
by rigid disks and square plates, 3000
of sound pulses at slit in reflecting screen, 2417
theory, 3118
singularities at sharp edges, 2210
Dipole moment, of gases, 764
Direction finders, Adcock, polarization errors in, 3143
single-receiver, automatic, for 100–150 Mc/s, 1078, 1938, 1940
aural-null and visual methods of bearing display, 3142
automatic, 1394
airborne, 1058
c.r., h.f., naval, 1064
h.f., airborne, resonance effects in, (A)1672
performance in ships, 1063
symmetrical screened transformers for, 969
marine, 94
m.f., crossed-loop, 3431
mobile, spaced-loop, 1076
rotating H-Adcock, 2234
test equipment for, 2575
U-Adcock, polarization error, 1062
—— **finding,** (D)1066
asymmetry errors in Adcock systems, 1293
by cyclical differential measurement of phase, 1059, 2233
h.f., with Adcock aerials, 1077
bearing errors due to masts, 1074
probable accuracy of, 1068
ship aerial systems, 1075
m.f., in British Navy, 1065
with multi-aerial Adcock d.f. systems, 1061
naval, v.h.f., 1060
personal errors in, 91
radiogoniometers, for atmospherics, operation threshold of, 92
recent progress in, 1393
relation between speed of indication, bandwidth and signal/noise ratio, 2232
site errors at v.h.f., 3145
statistical plotting methods for, 1067
statistical theory of fixing, 1069
Discharge, (See also Corona)
direct, impulse characteristics of ground, 723
gas, dielectric properties of, 1917
electronic interaction in, 1641
h.f., starting potential of, 2500
glow, between coaxial cylinders, 2781
h.f., experimental investigations, 2498
in rarefied gases, 362
Discriminators, crystal, 1000
frequency, harmonic distortion in, 3534
response to pulses, 2311
wide-band, design of, 2483
l.f., 2742
phase, for f.m. receivers, 1001
Displacement measurement, electronic, 2589
using r.f. gas-discharge phenomenon, (A)1733
Dissipation, in medium with selective absorption, 1756
Distortion, amplitude and phase, 3392
attenuation and phase, in coaxial cables, 14
and effect on television signals, (A)654, 1871
in coils with laminated-iron cores, 2738
delay, in television transmission, 1521
formula, closed form of, 1303
in f.m. circuits, (D)324, 2038
calculation of, 1883
harmonic, in frequency discriminator, 3534
hysteresis, in Pupin coils, 1168
measurement, in frequency modulator, 1991
proposed standards for sound recording, 791
simple method, 2577
nonlinear, in amplifiers, 3107
and bandwidth of f.m. signals, 1177
in dynamic loudspeakers, 2135
measurement of, (A)1713
in u.h.f. diodes, 2386
path-time, in carrier-frequency amplifiers, 2494
in pulse-count-modulation systems, (A)1785
of scanning waveforms, 3271
in speech and music transmission, (AD)937, (AD)2706
telegraphy, effect of filtering on, 2751
tracing, in gramophone records, 2705, analysis of, 2704
transient, in networks, (A)652
Dynamometer, piezoelectric, for recording work of machine tools, 161

E

Ear, adaptation to sound stimuli, 2702
cochlea, as frequency analyser, 1259
physical basis of action of, 1260
cochlea partition, resonance at various points of, 2122
vibration of, 2121
fatigue, measurement with audiometer, 1568
middle, structure of, 2120
Earthing, behaviour of connections subjected to high-current surges, 1697
devices for communication equipment, 1197
Eddy currents, (See also Ferromagnetic materials; Magnetic materials)
losses at u.h.f. and surface roughness, 2502
Electrets, 1307, 2458, 3359
design and performance of, 1879
Electrical engineering, fundamentals of, (B)923
in tropics, 739
—— **theory,** tensorial, 2541
Electrodynamics, classical, without singularities, 1359
Electrolyte tank, for measurement of steady-state and transient response of networks, 2743
use for study of axially-symmetrical magnetic fields, 1968
Electromagnetic field, application of conformal representation to, 1645
h.f., uniform, production of, 1430, 2784
methods of analysis, 691
microwave, in narrow gaps, 2149, (C)2444
nonlinear theories of, 2207
of point current source on earth's surface above inclined strata, 1356
spiral, due to eddy currents in cable sheath, 3334
spiral-phase, properties and applications of, 2228
—— **theory,** elements of, (B)2788
and Lagrange's equations, 1646
law of action between moving charges, 2783
series developments for retarded potentials, 2208
surface currents on conducting sphere excited by dipole, 1592
Electromagnetism, (B)75
experimental basis of, 3123
and gravitation, 3128
Electromagnets, cyclotron, soft iron for, 2538
Electromedical apparatus, pulse generators, 2020
Electrometer, automatic, precision, 3473
dynamic, direct reading, 2845
Electron beams, in axial field, (A)1639
control by intersecting beam, 3294
deflection of, 2677
deflection theory, 2787
high-current, in e.s. fields, 3577
tubular, properties of, 2204
—— **diffraction,** from Si and pyrite surfaces, 1952
—— **emission,** from oxide cathodes, microscope for study of, 3486
secondary, 2501
in output valves, 2969
suppression in microwave valves, 558
thermionic, 3407
—— **guns,** design of, 1550
for h.v. tubes, 1460
—— **inertia,** effects in valves, 254, 1233
—— **lenses,** with correction for spherical aberration, 1457
e.s., aperture errors of, 2880
asymmetry of, 2879, 3510
distortion-free, 2292
optics of, 1746
with hyperbolic field structure, 813, 1456
immersion objective, axial-potential calculation for, 2597
magnetic, with curvilinear axis, 1458
—— **microscope,** aberration correction with electron mirrors, 2019
chromatic aberration and resolving power in, 1453
developments in Germany, 1939–1946, 2368
fluorescent screen for, 2293
horizontal, 1747
illumination system for, 3511
image phase contrast in, 2881
R.C.A. Type EMU, adjustable aperture for, 184
resolution limit of, 1745
using secondary electrons, scanning principle, 3512
use in optical industry, 2598
voltage stabilization for, 1805
—— **microscopy,** British developments, 182
conference, Cambridge, Sept. 1948, 1749, 2882, Delft, 3513, London 1948, 474
survey, 1454, 1748
—— **motion,** in cavity magnetron, 1557
plotting of trajectories, 357, 688, 1751
under space-charge conditions, 3120
—— **multipliers,** 3297
photoelectric, 2074
pulse period of, 1152
RCA Type 931A, background noise in, 3298
use in scintillation counters, 1446
—— **optics,** for fields of axial symmetry, 1351, 2780
focal properties of immersion objective, 183
of h.f. valves, 1559
of immersion systems, 814
investigations in Germany, 1939–1946, 2205
of magnetic field bounded by parallel planes, 3209
refractive index in, 1455
—— **plasma,** cylindrical, influence of transverse magnetic field on, 1360
—— **resonators,** palletron, 810
—— **scanner,** for surface investigations, 3227
—— **streams,** fluctuations due to ions, 689
—— **theory,** recent developments of, 3401
—— **tube,** for viewing magnetic fields, 1919, 2375
Electronic applications, (See also Diathermy: Heating) (B)2295; acceleration measurement with valve, 812; automatic compensation, 171; automatic station-call selector, 3262; in biology, 1741, cardiochronograph, 1153; classifying, cataloguing and counting systems, 2290; control, German industrial electronic methods, (B)2887, of high-temperature furnace, 2581, process, automatic, 3503; temperature, 861; displacement measurement using r.f. gas-discharge phenomenon, (A)1733; electron scanner for surface investigation, 3227; food preservation by capacitron, 478; gauges, 1736, 2009, thickness, using radioisotopes, (A)1733, 3493; in guided-missile research, 476; half-tone engraving machine, 2592; in heavy engineering, 3221; image-brightness intensifier, 469; in industry, (D)467, 2012, (AD)3218, elementary textbook, (B)2296, reference book, (B)1753; in industry and research, 1740, (B)3516; in iron and steel industry, 809; to machine tools, 1449, (A)3507; metal detector, for conveyors, 2883, for use in saw mills, 3514; in nuclear physics, 1146; pressure and displacement measurement, 2589; prospecting,radio methods, 187; register control in printing, 808; rotor balancing with capacitor gauge, 3504; for study of shell flight, 186
—— **engineering,** trends in, 2987
Electronics, (B)2890
advances in, (B)2889
engineering, Electronics Park, Syracuse, N.Y., general description, 592
experimental, techniques in, (B)2297
in Germany 1939–1946, (A)466, (B)2414, 2691
Electrons, field-emission of, 1356
Electrophotoluminescence, 110
Electrostatic field, automatic plotting of, 1125
near circular aperture or short cylinder, 64
inside clouds, 1388
of plane electrode with elliptical hole, 1352
of point charge inside cylinder, (C)687
during solar eclipse 28th April 1949, 2521
Electrostriction, in $BaTiO_3$ ceramics, 1088
and ultrasonics, 1843
Equalizer, phase and amplitude, for television, 1893
for a.f. amplifiers, 1271
Exhibitions, amateur radio 1948, 1015; B.I.F., electronic equipment at, 3220; components, Paris, 1949, 1634; electronics, Manchester 1948, 807, Manchester 1949, 3219, 3506; Paris Fair 1949, 2990, 2991, 2992, measurement apparatus at, 2842; Physical Society 1949, 2198; Radiolympia 1949, 3472; R.C.M.F., components 1949, 1912
Extensometers, resistance-type, 173

F

Facsimile, 1202
high-speed electrolytic recording for, 536
high-speed equipment, Philips, 2338, receiver for, 2657, transmitter for, 2656, transmitter and receiver synchronization, 2925, transmission of signals, 2923
rapid, new methods, 3557
service from Britain to Europe, 1515
transceiver, Western Union telefax, 3558
ultrafax system, 1203, (A)1785, 2055, 2340
Western Union teletape, 2647
Fading, (See also Wave propagation, e.m.; Waves)
periodic, of s.w. signals, 1166
short-range, of broadcasting transmissions, 2036
Fault location, (See also Cables)
in cables, sensitive equipment, 3189
Feedback, 2175
electromechanical, 603
negative, in amplifiers, 2197, (C)2767
in f.m. systems, 3548
Ferrimagnetism and antiferromagnetism, 3159
Ferromagnetic materials, (See also Alloys; Magnetic materials)
alnico, magnetic structure of, 1955
alnico and vicalloy, magnetic structure of, 1954
anomalies at r.f., 72
coercive field and crystal dimensions of Fe powders, 3436
CuMnGa alloys, 1406
CuMnIn alloys, structure and properties of, 1956
magnetic phenomena at cm λ, (A)364
new, 3437
permeability at u.h.f., 1409
powdered-iron compacts, permeability and sintering temperature, 3455
sheet steel, 756
Si/Fe and Ni/Fe alloys, in weak a.c. fields, 1686
soft, H.C.R., 2810
Ticonal, 1898
Ferromagnetism, theory of, 2782; at v.h.f., 1994
Field strength, (See also Reception; Television; Wave propagation, e.m.)
absolute measurement of, 1987
calculations, and ionospheric absorption, 2301
maximum, round aerial in waveguide, 646
measurement of, (A)428
for h.f. e.m. fields, 429
by means of h.f. direction finders, 1118
with rotating probe, 1714
for WWV transmissions, 491
television, u.h.f., near Washington, 1480, 3526
Films, (See also Sound recording; Sound reproduction)
metal, thin, effects of adsorbed gas on resistance, 2786
resistance of, at cm λ, 766, for Cu, Ag, Pb, 1959, for Cu/Ag, 1960, for Ni, 1961
Filters, (See also Networks: Quadripoles) 1618, (B)2712
acoustic, properties of lined ducts, 3014
a.f., valve-assisted, 3083
analysis with mechanical harmonic synthesiser, 3373
band-elimination, for carrier system, 2752
variable, 59
band-pass, for carrier system, 2752
design curves for, 2749
dissipative, design of, 3369
resonant-section, 2170
single-circuit and optimally coupled, in amplifiers, 2493
branching, for waveguides, 294
calculation of, use of sn elliptic functions, 1319
crossover, for disk recording, 2470, 3085
crystal, EDT, 2468
for radio receivers, 200
for radiotelegraphy receivers, 1892
s.s.b., 349
variable-bandwidth, 1889
wide-band, for carrier programme circuits, 679
design, by means of electrolyte-tank measurements, 2750
by frequency transformations, 1317
for s.s.b. transmitter, 3290
frequency-selector, for u.s.w. multichannel systems, 3545
insertion characteristics of, 985
ladder, classification of half-sections of, 2748
LC toroidal and parallel-T feedback-amplifier, comparison of, (A)1612
low-pass, using coaxial transmission lines, 680
L-section, design of, 3370
m-derived, properties of, 1890
transients in, 3081
matched, nonsymmetrical, 58
operating-parameter theory, 1888
and oscillators, relation between, 3375
RC, 3084
rectifier, chart for, (A)1612
telephony, effect of termination and losses, 1891
theory of, 1422
transmission-line, 1617
waveguide, maximally flat, 1320
paralleled-resonator, 1619
theory and design of, 3374
wide-band, 2469
for 150-kc/s carrier system, 2471
Finishing, protective, of electrical equipment, (D)1094
Flaw detection, (See also Ultrasonic applications)
railway track inspection car, 3502
—— **detectors,** ultrasonic, design of, 804, 1447
Flicker effect, in saturated diodes, 2958
Fluctuations, (See also Noise)
electrical, in conductors, 1362
in electrometer circuits, 1123
spontaneous, 61, in amplifier valves, 1631
theory of, (D)1247
Fluorescence, influence of temperature quenching on decay, 3157
in willemite, decay and quenching of, 3156
Fluorine, chemistry of, 736
Fluxmeter, direct-reading, 1721
Frequency allocation, for B.B.C. television service, 2047
for European broadcasting stations, 832, 1181
F.C.C., for aeronautical services, above 400 Mc/s, (A)1672
F.C.C., for mobile communications services, 2907
analysis, (B)2007
bands, proposed standard nomenclature for, 2412, 2413
changers, electronic, for parallel operation of aircraft alternators, 655
comparator, using circular timebase, 2854
c.r., for 1-kc/s substandard tones, 3194
using cycloidal patterns on c.r.o., 3481
control, apparatus for, (A)1612
automatic, for mechanically-tuned oscillators, (A)1612
for microwave oscillators, 3096
for television sweep circuits, 2336
by transitrol valve, (A)1235
for railway-signalling power supplies, 2054
in transmitters, 2070
deviation control, for f.m. transmitters, 3576
dividers, 53
multivibrator, high-ratio, 52, 3100
quasi-aperiodic, for low a.f., 1336
regenerative, 2481
division, synchronous, 1337
doublers, aperiodic, 1335
instantaneous, 826
measurement, of a.f. fundamentals and harmonics, 1429
limits for comparison at great distances, 1427
by sliding harmonics, 433
to 12 kMc/s, 2838
to 40 kMc/s, 1725
meters, absolute, 14 kc/s–25 Mc/s, 270
[illegible], 2273
direct-reading, a.f., 2272, to 10 Mc/s, 156, 1129
heterodyne, 5–1000 Mc/s, 2001
multiplication, 2175
multipliers, low-power, 340
negative, 24
optimum, for line-of-sight systems, 481
plotting, new scale for a.f., 3319
standards, atomic clock, 1983, 2549
l.f., electromechanical derivation of, 2260
microwave, (A)1712, 2552, secondary, 1114
primary, absolute accuracy of, 2551
swing, with reactance valves, 2182

G

Galactic radiation, r.f., (See Cosmic noise)
Galvanometers, a.c., 3199
influence of reactive feedback networks on response, 1014
moving-coil, sphere and toroid types, 2843
voltage-sensitivity increase for, 778
sensitivity limit of, 3200
valve, with ordinary valves, 3201
Generators, (See also Oscillators; Signal generators)
e.s., high-power, 2337
Van de Graaff, at A.E.R.E., 2018
high-stability, for 3.5-Mc/s and 7-Mc/s bands, 1333
magnetostriction, 1802
for measurement at dm λ, 158
multiple-valve, high-power annular circuits for, (A)1612
pulse, (B)917
for medical applications, 2020, 3097
slave frequency, 1899
sawtooth, high-power, using synthesis of square waves, (A)1612
l.f., synchronized, (A)1612
15 c/s–500 kc/s, 1901
square-wave, thyratron, 2759
s.s.b., 2479
surge, multi-stage, trigger circuit for, 869
thermoelectric, design of, 1806

- thermomagnetic, 1309
- ultrasonic, 2281
  - with quartz control, 967
- 2-kW and 500-kW, for h.f. heating, 270

Geomagnetic storms, (See also Solar activity)
- and cosmic-ray intensity, 3420
- and solar activity, 1369, 1653, in 1947, 82, Oct.–Dec. 1947, 371, in 1948, 1923
- and solar cycle, 1657,
- and sunspot of 22nd Jan. 1949, 1654
- and sunspots, (A)1370, 1924
- Oct.–Dec. 1947, 382, Jan.–June 1948, 713, July–Sept. 1948, 1046, Oct.–Dec. 1948, 2223, Jan.–March 1949, 3421

Geomagnetism, (See also Ionosphere; Solar activity
- abnormal daily variation of H at Huancayo and in Uganda, 710
- activity at Niemegk, 1946, (A)712
- Canadian aerial survey, 1734
- daily magnetic activity figures *C*, Abinger data, July–Sept. 1948, 1043, Oct.–Dec. 1948, 2222
- daily variation near equators, 1927
- effects during solar eclipse, 20th May 1947, 1041
- field due to earth currents in estuary, 384
- field within the earth, 3130
- *K*-indices, Abinger, Oct.–Dec. 1947, 378, Jan.–June 1948, 709, July–Sept. 1948, 1043, Oct.–Dec. 1948, 2222
  - Cheltenham, Oct.–Dec. 1947, 379, Jan.–June 1948, 708, July–Sept. 1948, 1044, Oct.–Dec. 1948, 2221, Jan.–March 1949, 3419
- and nonuniformity of the earth's rotation, 1656
- parameters deduced from limited-area observations, (A)705
- pre-history of, 1045
- quiet and disturbed days, Jan.–June 1947, 383, in 1947, 707
- radial variations of field, 380
- recent work on, (AD)81
- and rotation, 703, 704, 2219
- secular change, 381
- selected days, preliminary mean *K*-indices and *C* numbers, April–June 1948, 1042, July–Sept. 1948, 2220, Oct.–Dec. 1948, 3418
- solar-diurnal variation in, 711
- sudden commencements, Abinger, Oct.–Dec. 1947, 378, Jan.–June 1948, 709, July–Sept. 1948, 1043, Oct.–Dec. 1948, 2222

Germanium, non-rectifying, 742
- and transistor, 1968

Ground conduction, effects in transmission systems, (B)3554
- conductivity, measurements in Schleswig-Holstein, 2832
- constants, measurement of, 2261
- resistance, measurement of, 1716

H

Harmonic analysis. See Waveform analysis.

Hardening, surface, by means of h.f. induction currents, 2885

Hearing, audiometer, direct-reading, 3325
- and Brownian movement, 3010
- masking of tones by repeated bursts of noise, 623
- of own voice by bone conduction, 2120
- threshold, effect of high altitude, 621

Heating, dielectric, at cm λ, 2288
  - h.f., 2876
- h.f., German methods, (B)2888
- induction, h.f., 465, circuit theory for, 2174, of substances of low conductivity, 3505, surface treatment of steel, 1143, 2885
- induction and dielectric, h.f., 1738, 2010
- r.f., economic aspects of, 2590

High voltage, (See also Breakdown; Corona)
- measurement, by oscillating electrode systems, 780

Horns, (See also Aerials)
- e.m., 3042
  - radiation from, 3041

I

Ignitrons, sealed, for transmitter power supplies, 556

Impedance, (See also Aerials; Charts; Transmission lines)
- acoustic, matching by means of screens, 610
  - measurement of, 2700, for small circular orifices, 2701
- of composite conductors, 3060
- matching, broad-band, 326, for aerials and feeders at 500–600 Mc/s, 1596, dissipative structures for microwaves, 2466, with several intermediate elements, 665
  - design of frequency-compensating matching sections, (A)1612
  - h.f., balanced-to-unbalanced unit, 1884
  - with line segments, 37
  - with universal adjustable transformer, 981
  - with variable-frequency transformer, 982
- measurement, for dm λ, 1718
  - and matching, for television aerials, 18
  - for microwave transmission lines, (A)1713
  - by *Q*-meters, 3192
  - by reflection method, for dipoles, 2559
  - for transformers, by bridge methods, 2263
  - for transmission lines, 2264
  - for vertical aerials with ground planes, 2440
  - at 100–400 Mc/s, 432
- mechanical, electrical equivalent of, 603
- meter, automatic, 1723
  - using swept-frequency 3-cm indicator, 1120
  - for 144 Mc/s, 2835
  - for 50–500 Mc/s, (A)1713
- motional, of magnetostriction elements, 2116
- mutual, of centre-driven parallel aerials, 1295

Inductance, of circular coils, approximate formulae for, 3356
- measurement, modification of Astbury's method, 1999

Industry, German and Japanese, reports on, 267

Infra-red Cs arc, dynamic properties of, 512
- German war-time applications, 457
- image converter, 798, 1147
  - developments in Germany, 1939–1946, 2368
  - electron-optics of, 2294
- location, German equipment, 1731
- radiation, present knowledge and technical applications of, 1134
  - ultrasonic detection of, 273
- rays, range of, 1020
- spectrometer, industrial, 3494
  - recording, 459
  - TlBr/TlI prism for, 737

Insertion loss, measurement equipment for video frequencies, 2836

Instruments, (See also Meters and individual subjects)
- a.c., rectifier-type, effect of waveform on accuracy, 765
- electronic, (B)454
- h.f., German, (B)2865
- manual of, (B)3318

Insulating materials, (See also Plastics)
- cellulose, aging properties of, 1693
  - impregnated with semiconductor, dielectric properties of, 747
- ceramic, $BaTiO_3$, anomalous specific heat of, (A)1090, dielectric behaviour of, 745, 746, electrical conductivity and refractive index of, (A)1091, electrostriction in, 1088, properties and applications of, 2533
  - $BaTiO_3$ crystals, domain structure of, (A)1089
  - for capacitors, (B)2821
  - dielectric properties of, 2537
  - electrical properties of, (A)1692
  - h.f., recent developments in, 3447
  - with high dielectric constant, 1413, 2536
  - and their manufacture, 2251
  - piezoelectric, use in transducers, (A)1269, 2128
  - porous, air-flow resistance of, 3018
- ceramics and glasses, dielectric properties at cm λ and 20°–400°C, 2248
- conductivity due to electron bombardment, 3404
- ebonite and fibre, dielectric properties at u.h.f., 743
- glass, electrical properties of, 1689
- mica, Indian, electrical properties of, 744
- for microwave attenuators, 1691, 2535
- modern developments in, 117, 2815
- new, (A)3442, development of, 3166
- paper, direct voltage tests for, 3206
  - effects of humidity and temperature, 3448
- polycrystalline, polarization and losses in, 1971
- polytetrafluoroethylene, change in specific volume at 20°C, 3449
- polythene, crystallite size and electric strength of, 1696
- Si compounds, 1086
- silicones, preparation and properties, 1687
- synthetic, Araldite resin, 3450
  - new, 120
  - polymers, electric strength of, 1695
- titanates, dielectric properties of, 1970
- for u.h.f., 1099

Integrators, current, automatic, 2455
- for small voltages and currents, 1996

Interference, (See also Reception; Television)
- adjacent-channel, in mobile communications, 2914
- by corona, with reception in aircraft, 363, 2621
- cross-modulation, in 100-Mc/s band, 504
- heterodyne, eliminator for, 1782
- from h.v. corona, 1780
- ignition, 1779, 3248
  - with f.m. transmissions at 45 and 90 Mc/s, 508
- impulsive, in a.m. receivers, (D)503
  - in superregenerative receivers, 2618
- measurement and suppression, 1781
- suppression, with goniometer device, 3249
  - in ships, 2316
  - for the ' Voice of America ', 3538
- in television, from amateur transmitters, 3285, 3286
  - from H.R.O. receiver, 3287
- from television receivers, (A)205
- with television sound, reduction of, 1179
- of two f.m. transmitters, 2620

Interferometer, acoustic, double-crystal, 1257
- for microwave measurements, (A)1713

Ionization, in atmosphere, 1378
- gauges, design, 1948

Ionosphere, (See also Atmosphere; Wave propagation, e.m.)
- anomalous absorption effects, 192
- approximate solution of reflection problems, 1050
- Chapman region, influence of vertical ionic drift, 2793
- control points, abacs for, 3235
- correlation of F_2-layer critical frequency with meteorology, 86
- critical frequencies and solar activity, 1051
- critical-frequency difference variations in, 2516
- critical frequency near $\tau = 1$, 715
- data, comparison for antipodal points, 1660
  - at Wuchang, Sept. 1946–Dec. 1947, 716
- deviation of reflected waves for vertical incidence, 1763, (D)2607
- disturbances, and terrestrial effects, 1930
- double refraction in, 3519
- D region, conductivity and tidal motions in, (D)85
- effects during dawn solar-noise observations, 1033
- E layer, production of, 388
- and e.m. wave propagation, 3522
- formation and mechanism of layers, 1380
- F layer, abnormalities near Brisbane, 1662
  - horizontal motion of, 1663, 1664, 2517
  - horizontal and vertical motion in, 2517
  - longitude effect of, 389, and m.u.f. forecasting, 2794
  - seasonal variation in ionization, 3427
- f^oF_2 and sunspot numbers, 391
- forecasting of conditions, (D)483, (D)2894
- forecasting critical frequencies and disturbances, 2227
- height determinations, reliability of, 2515
- height of reflection in curved layer, 3423
- influence on s.w. radio communication, 88
- interaction of radio waves in, 194, (A)486
- lunar and midday effects at Huancayo, 3426
- lunar tides in, 718, 719, 1052, in D layer, 3133, in principal regions, 1665
- magnetic triple splitting in, 2791
- magneto-ionic measurements in high latitudes, 717
- over mid-Germany, Jan.–Oct. 1948, 1475, Jan. 1949, 1661, Feb. 1949, 1934, March 1949, 2518, April 1949, 2519, May 1949, 2792. June 1949, 3131, July 1949, 3425
- model of, 386
- nonuniform, induction of electric currents in, 1049
- observations, of scatter clouds, 84
  - during solar eclipse, 9th July 1945, 79
  - in Spitzbergen, 2796
- penetration by echoes from moon, 2030
- polarization in, 1465
- radio detection of sporadic-E effects, 1364
- recording equipment, panoramic, 789
- reflection, analysis of, 1381, 2606
  - phase difference between two waves, 1474
- research at Watheroo, 1938–1946, (B)397
- review for 1948, 1385
- solar tides in, 1053
- sounding equipment, 2004, 2069, 3062
- sporadic-E clouds, and amateur research, 1666
- sporadic-E ionization, 3135
  - measurement of, 2226
- sporadic-F layer, 390
- structure of, 1048
- temperature of, 1054
- tilts in, 3424
- transient radar echoes from, 89
- upper, new method of exploration for, 387
- virtual height measurements at 100 kc/s, 3132

K

Keying, frequency-shift, 841

Klystrons, See Valves.

L

Laboratory, 8-channel signal distribution system for, 1116
- radio, handbook for, (B)3492
- technical acoustics, Copenhagen, work of, 3324

Leak detector, mass-spectrometer type, 408

Lenses, (See also Electron lenses)
- microwave, 3339
  - delay, electrolyte-tank measurements for, (A)1713
  - metal, 1868
  - metal-plate, optics of, (A)1578
  - metal-strip delay structure of, 2147
  - path-length, 3058
- ultrasonic, plastic, (A)1421

Library, Patent Office, 1561

Lightning, 1391
- artificial, path resistance of, 2798
- discharge mechanism of, 90
- effects in underground cables, 2799
- photographic study of, 722

Limiters, effect on a.m./f.m. wave, 1505

Loudspeakers, dynamic, nonlinear distortion in, 2135
- modern technique, 1855
- performance measurements, 3207
- permanent-magnet, Voigt, 1573
- for theatres, 631
  - design and performance of, 3026

Luminescence mechanism in phosphors, (D)2807
- polarized, 2203
- 2nd Moscow conference, 1948, 2202

Luminescent materials, preparation and properties of, (B)126

M

Magnetic energy, mutual, of current and magnet, 365

—— **field,** a.c., penetration into solid iron, 3411
- of axial symmetry, plotting with electrolyte tank, 1988
- effect on radiation from Ra-E, 694
- lines of force made visible, 1919, 2375
- of massive rotating bodies, 703, 704, 1374, 1655, 1925, 2219
  - and gravitation, 1039
- measurement by electronic fluxmeter, 435
- of ring sound-recording head, 636
- uniform, coil systems for, 3468
  - maintenance of, 1720

—— **materials,** (See also Alloys: Ferromagnetic materials) 750, 1417
- anisotropic alloys, Alcomax, 3453
- for electrical power plants, (A)3442
- ferrites, 1085, 2809
  - dispersion and absorption at frequencies above 1 Mc/s, 3160
  - of Ni and Mg, longitudinal magnetostriction of, 3163
  - properties of, 3159
- hiperco, 751
- new alloy containing Nb, 1101
- properties of, 1357

—— **properties,** of Fe, theory of wattmeter and bridge measurements, 771
- of $Fe_2O_3\alpha$, theory of, 3161
- measurement with c.r. hysteresis loop tracer, 146, 772, 773
- of powdered Fe/Ni alloys, 1418
- of silicon-iron, 1407

—— **storms.** See Geomagnetic storms.

—— **susceptibility** and loss, measurement at h.f., 144

—— **testing,** symposium at 1948 A.S.T.M. meeting, (A)3467

Magnetization, in perpendicular direct and alternating fields, 1410

Magnetometers, airborne, 477, 815, use for Canadian survey, 1734
- remanent, high-sensitivity, 3469
- saturable-core, applications of, 436

Magnetostriction generators, 1802
- longitudinal, of ferrites of Ni and Mg, 3163
- use for torque measurement, 463

Magnets, permanent, 749, 3170, 3452
  - magnetization of, 1415
  - materials for, 1416
  - perfect, 3408
  - made from pure iron powder, 2816

Maps, zenithal-equidistant, construction of, 591

Metals, and alloys, new, development of, 3166

Materials, various, tabulated properties of, 3167

Mathematical tables, Bessel functions, (B)1708, of fractional order, (B)1980
- elementary functions, (B)2828
- higher functions, (B)2826
- sine and cosine integrals, (B)3462, iterated, 1702
- 5-figure, (B)1981, of natural trigonometrical functions, (B)1709

Mathematics, algebra, Boolean, use for synthesis of 2-terminal switching circuits, 2456
- analysis by means of time series, 3175
- basic, for radio, (B)423
- Bessel equations, table of roots for calculating cavity-resonator frequencies, 417
  - and waveguide theory, 416
- calculus, operational, (B)1426, and applications, (B)2827, history of, 1313
- differential equations, linear, with constant coefficients, integrator for, 1424, with slowly variable coefficients, 1423
  - linear partial, models for, 1706
  - partial, solution by means of resistance networks, 3460
- elliptic functions, numerical computation of sn(mK/n), 2543
- Fourier analysis, and electrocardiogram, 2255
- Fourier transforms, and transit-angle functions, 2981
- functions, aleatory, harmonic analysis of, 2254
- integral equations, solution using Laplace transform, 757
- Laplace transformation, introduction to, (B)3182, and solution of linear integral equations, 757
- odd and even components of analytical function, 1422, (C)1976
- and radio problems, 1106
- spherical harmonics, (B)3181
- tensor analysis, review of work of Gabriel Kron, 127

Measurement, (See also individual subjects)
- apparatus, at 1949 Paris Fair, 2842
- equipment, for dm waves, 3198
- h.f., conference on, 1985
- of phase and group transmission times, 1115
- of radio quantities, above 300 Mc/s, (A)427, below 300 Mc/s, (A)426
- technique, for cm waves, 2554
  - h.f., German, (B)2865, using transmission lines, (B)2866
- u.h.f., using coaxial elements and connectors, 437
- of Z, C, L and f by proportional currents, 3185

Medical research, waveform analysis of body potentials, 170

Metallizing, modern methods, 754

Metallurgy, powder, 1973, 2817
  - iron, German methods for, 3172
  - and manufacture of permanent magnets, 2816
  - Ni-Fe alloy dust cores, 122
  - 1948 Conference at Graz, 123, 753

Meteorology, (See also Radar)
- application of radio in, 1375
- radio, problems in, 1159
- use of radar, for detection of precipitation, 393
  - in forecasting, 385

Meteors, daylight streams, May–Aug. 1947, 76
- diffraction of radio waves from trails, 2508
- effect on radio, (A)370
- location of radiant by radar, 1031
- measurement of velocities, [illegible]
- radar echoes from, 2213
- radio detection of, 1364, theory of, 1392
- transient radar echoes from ionosphere, 89

Meters, (See also individual subjects)
  - light-pattern, for disk sine-wave records, 624
  - long-scale, for electrical quantities, 788

Microphones, calibration of, 763
- capacitor, bridge circuit for, 9
  - phase characteristics of, [illegible]
  - for stereophony, 10
- dynamic, moving-coil, 3022
- electrodynamic, miniature, S.I.F. MD.8, 2127
- free-field calibration to 100 kc/s in air, 620
- high-grade, noise level of, 3025
- interaction with couplers and earphones, 2129
- miniature, omnidirectional, 1853
- moving-coil, 1268
- open-circuit voltage measurement, 2130
- ribbon, B.B.C.-Marconi Type AXBT, 3024
- single-element, unidirectional, 1854

Microwaves, (See also Wave propagation, e.m.)
- biological effects of, 2283, 2284
- measurement technique for, 2554
- between parallel conducting sheets, optics of, 1292
- physical applications of, 1650
- power measurement with bolometer bridge, 2565
- technique of, (B)3152

Mine detectors, 185
- a.f., 1156
- magnetic, 1155

Mines, magnetic and acoustic, British developments, (D)[illegible]

Models, of e.m. systems, theory of, [illegible]

Modulation, (B)2007
- amplitude, of cm waves by electron beam, [illegible]
  - by electron-coupler valve at u.h.f., 2975

    - of magnetrons, spiral-beam method for, 2401
  - amplitude and phase, composite, 837
  - auto-anode, for broadcast transmitters, 2632
  - in communication, 836
  - frequency, 216, (B)529
    - application in s.w. radio technique, 2634
    - demodulation by limiter and discriminator, 1772, (A)3246
    - developments in techniques, 2633, 3549
    - by impedance valves, 1823
    - Miller circuit and its use for railroad radio, 343
    - of oscillators, 330
    - s.s.b., and wide-band f.m. television relays, 838
    - u.h.f., and coupled systems, 2475
    - use for amateur radio, 217
    - wide-band, 2362
  - frequency analysis of modulated pulses, 835
  - frequency and phase, (B)2916
  - frequency *vs* amplitude, in u.h.f. naval communication, 1504, (D)3257
  - general theory of, 2482
  - grid, linear, with feedback resistor in cathode lead, 1246
  - and keying, 2361
  - of light beam by P-type crystals, 65
  - meter, with S-scale, 2858
  - of oscillators, by resistor noise and shot effect, 3380
  - phase, circuit for, 341
  - pulse, 2636
    - conditions for pulse-splitting, 2910
    - distortion and bandwidth characteristics of, 846
    - for multiplex telephony, 845
    - spectrum of, (D)1789
  - pulse-code, 842, 843
    - demodulation methods for, 844
    - improvement of signal/noise ratio in, 2325
    - timing control for, 1788
    - use for television, (A)1785
    - 96-channel system, 516
  - pulse-count, 519
    - distortion in, 768
  - pulse-position, efficiency of information reception in, 3550
  - pulse-time, interference characteristics of, (A)1785
    - noise-suppression characteristics of, 2314
  - of resonance lines in Cs arc, 512
  - synchrodyne, of klystrons, (A)1822
  - systems, pulse, signal/noise ratios in, 502
    - for R/T transmitters, (A)1533
  - ultrasonic, of light beam, 1255, 2626
  - wide-band, with magnetron, (A)894
- **Modulators,** balanced-rectifier, (D)1224
  - broad-band, high-level, 246
  - frequency, serrasoid, 342, 2363
  - magnetron, (B)917
  - producing 10^6 0.1-μs pulses/sec, 2185
  - radar, thyratron, 2391
  - ring, h.v., 3293
    - nonlinear effects in, 2184
  - ring and Cowan, analysis and design of, (D)2944
- **Monitoring** of a.m. and f.m. broadcasting stations, legal requirements, 2859
  - systems, stability and efficiency of, 2331
- **Monitors,** for a.m. broadcast stations, (A)1713
  - for f.m. broadcasting stations, 449
  - for television broadcasting stations, 450
- **Moon,** as reflector of radar and radio signals, 1937, 2030
- **Multiplier,** electromechanical, for modulated voltages, (A)1612
- **Multivibrators,** with RC coupling, grid current in, 1902
  - symmetrical, 2181
  - theory of, 50
  - voltage-controlled, 3381

N

- **Navigation aids,** aerial, aircraft distance measurement, beacon system for, 1402, (A)1944, 2527, crystal control at 1000 Mc/s for, (A)1672
    - aircraft ground position indicator, 1396
    - aircraft ground-speed measurement by pulse-Doppler radar, (A)1672
    - beacons, rotating-field, 1946
    - for Berlin air lift, 3147
    - combination of dead-reckoning and radar data, 1395
    - course computer, 422, 3148
    - c.w., long-range, (D)402, short-distance, (D)402
    - design of multiple-function equipment for 960–1660 Mc/s, (A)1672
    - echo suppression in pulsed radar systems, 1945
    - homing beacons for naval aircraft, 99
    - H_2S, indicator for, 1679
    - landing cable, 2805
    - monitoring equipment for homing and blind approach, 159
    - multitrack radar range, 2527, 2804
    - omnidirectional radial-track guide, 100
    - requirements for civil aviation, 401
    - universal beacon system, 1080
    - v.h.f., receiver and aerial system, (A)1672
    - in wartime, 1400
    - work of Radio Technical Commission for Aeronautics, (A)1672
  - for air traffic control, 403
  - Decca, equipment for small ships, 3432
  - marine, radar, 1677, 2235
      - American views on, (A)2803
      - charts and chart matching for, 2803
      - design of, 2803
      - development of, 1942
      - experience with, 2803
      - fitting of, 2803
      - fitting and use of, 2803
      - improvement of reflections from small objects, 2803
      - operational factors, 2803
      - operational value of, 2803
      - present outlook, 2803
      - in U.S. ships, (A)2803
    - survey, 93
  - using nonsynchronous multiplex systems, (A)1672
  - radar, (B)1063
    - for ferries, 2808, Tilbury-Gravesend, 1398
    - for harbour supervision, 2803
- —— **systems,** aerial, for approach and landing, (A)1672, 2238, c.w., 96, Dimeal, (A)1672, performance criteria for, (A)1672, 330-Mc/s, characteristics of, (A)1672
    - consol, 103, 2237
    - Decca, 1401, with lane identification, 1678, 2802
    - hyperbolic, P.O.P.I., 95
    - long-range, (A)1672
    - loran, (B)106, 3434
    - omnirange, 3149, 3433, v.h.f., 3141
    - radio, review of, 1399
    - teleran, 404
  - relation between speed of indication, bandwidth and signal/noise ratio, 2232
  - R.T.C.A. recommendations, 2236
  - sonic hyperbolic, for harbours, 626
- **Network analysis,** (See also Circuit analysis)
  - with harmonic synthesiser, 2460
  - involving realizable filter functions, 666
- —— **synthesis,** for given transient conditions, 2461
- **Networks,** (See also Circuit theory; Filters; Impedance; Quadripoles)
  - active, broad-band, (A)1612
    - stability criterion for, 2463
  - amplitude and phase relations in, 1312
  - approximation in time domain, (A)1612
  - band pass, with coupled resonant circuits, (A)1612
  - bridged parallel-T, for suppressed-carrier servo systems, (A)1612
  - constant-phase-shift, 3078
  - delay, design for constant delay, 3368
    - from low-pass units, 38
  - equalizing, RC and RL, transfer functions for, 2163
  - ladder, homogeneous, finite, transients in, 965
    - reactive, 1887
  - linear, active, matrix analysis of, 2744
    - with amplitude distortion, transient response of, (A)1612
    - damped, transient response of, 653
    - theory of, (A)1612
  - mesh, symmetrical, general, theory of, 979
  - *n*-reactance, synthesis for desired transient response, 3360
  - phase and group transmission times, 1115
  - phase-simulation, for carrier system, 2752
  - phase-splitting, wide-band, 1614
  - of prescribed frequency dependence, 2-pole, 3365, 4-pole, 3367
  - quadripole, no-load, insertion and echo loss for, 984
  - RC, bridged, 3073
    - double-T, 2746
    - synthesis of, 2462
  - RC lattice, synthesis of, (A)1612
  - steady-state and transient response measurement with electrolyte tank, 2743
  - theory, Thévenin's theorem, 1615, 2741
  - topology of, (A)1612
  - transient response, 36
    - equalization of, 2166
  - transients in, (D)350
  - video, phase and insertion-loss measuring equipment, 2836
  - wide-band, pulse testing of, (D)2862
    - visual testing equipment for, (A)1713
  - 2-terminal, impedance curves of, (A)1612
    - linear, passive, energy in transient regime, 3079
    - with nonlinear resistors, 2464
    - synthesis by means of gyrators, 3364
  - 2- and 4-terminal, *Q* measurement for, 2266
  - 2*n*-terminal, transmission losses in, 1321
  - 4-terminal, circle diagrams for, (D)2150
- **Night sky,** colour variations March 1947–May 1948, 1387
  - light, spectrum of, 1386
- **Noise,** (See also Cosmic noise; Fluctuation; Solar noise; Valves) (B)2007
  - from current-carrying resistors, 3067
  - factor, direct-reading meter for, 794
    - for receivers, 505, (C)1776, theory of, (A)1769
  - fluctuation, in receivers, (A)506
  - f.m., theory of, 203
  - generators, diode, at u.h.f., 567, (D)1832
  - in linear networks, 1488
  - measurement of, 1848, 2837
    - for u.h.f. receivers, 2833
  - in photocells, 897
  - radio, world distribution of, (A)396
  - reduction, in electrometer valves, 1997
    - and range, in radar and communication, (A)509
  - r.f., from thunder clouds, 2797
  - spectrum, of diode with retarding field, 2098
  - suppression characteristics of p.t.m., 2314
  - suppressor, dynamic, for gramophone records, 625
  - thermal, in a.m. receivers, 1489
  - in triggered circuits, and spurious signals, 1777
  - valve, effect on accuracy of linear amplifiers, 1229
    - grid, induced, 249, measurement of, (D)3311
    - l.f., from amplifying valves, 574
    - theory of, 584
    - total-emission, 249
    - and transit time, (D)583, (D)3310
    - in triodes, 571
  - valve and circuit, 255
    - heater hum, reduction of, 54
- **Nonlinear systems,** transient response of, 312
- **Nuclear** physics, investigations with e.s. generator, 464
  - radiation, application to industry, (A)1639
    - detection and measurement of, (A)1639
    - effect on tissue, (A)1639

O

- **Observatories,** recent work at, 1250
- **Optical systems,** Schmidt, correction plates for, 63
- **Optics,** applications in astronomy, 1019
  - of cm e.m. waves, 1647
- **Organs,** electronic, Hammond, design of, 470
- **Oscillations,** forced, resonance curves of, 1620
    - transient effect of needle impulses, 1324
  - nonlinear, 2256
  - in oscillatory systems, graphical evaluation, 969
  - parasitic, 2172
  - plasma, 1644, 2175
  - sawtooth, 51, 2175, (B)2773
  - in systems with one degree of freedom, approximate integration for, 3058
- **Oscillators,** acoustic, coupled, theory of, 1841
  - a.f., low-distortion, (A)1612
    - RC, Wien-bridge, 1624
  - amplitude-stabilized, pseudosynchronization of, (D)329, theory of, 44
  - analysis of frequency instability, (A)336
  - automatic load compensation of, (A)1612
  - beat-frequency, 50 c/s–200 kc/s, 3208
  - blocking, performance improvement at h.f., 2179
  - using cathode-coupled amplifier, theory of, 1334
  - crystal, for carrier supply, 2756
    - cathode-coupled, 2173
    - equivalent circuit of Curie double strip, 990
    - frequency variation of, 991
    - low-loss, 1326, (C)2136
    - series-mode circuit, 333
    - theory of, 2474
  - crystal-bridge, frequency variation of, 1895
  - double-triode, 47
  - and filters, relation between, 3375
  - f.m., 330
    - automatic frequency stabilization of, 26
    - single-valve, 1898
    - wide-deviation, 331
  - harmonic, linear, frequency deviation of, 966
  - h.f., electron-beam, 667
  - LC, with stable frequency, (D)[illegible]
  - mechanically-tuned, a.f.c. system for, (A)1612
  - microwave, mode separation in, 327
  - modulation by resistor noise and shot effect, 3380
  - performance analysis, (A)1612
  - phase-shift, 335
    - RC, variable frequency, 1896
    - reactance-valve modulation of, (A)1612
    - with very tight coupling, 2757
    - with wide-range tuning, 45
  - positive-grid, 46
  - pulsed, for f.m. cyclotron, 2017
  - relaxation, synchronization of, 668
  - stabilized, for multiplex telegraphy, 209
  - transistor, 912
    - for telemetry, 3065
  - transmission-line, with ordinary valves, 3094
  - triode, feedback, for dm λ, 999
  - twin, 3379
  - u.h.f., low-power, wide-tuning-range, (A)1612
    - power variation with mismatched feeder, 1894
  - u.h.f., using Type 833-A valve, 49
  - u.s.w., (D)338
  - valve, 334
    - limits of power output at u.h.f., 1332
    - oscillation amplitude in, 2176
    - self excitation of loaded triode, 2490
    - u.h.f., cathode-grid space phenomena, 1237
    - v.h.f., 337
  - van der Pol, theory of, 968
  - variable-frequency, f.m. of, 669
  - v.m., for λ 3.2 cm, 339
  - wide-range, deviable, 2177, 2478
- **Oscillatory systems,** nonlinear, equivalent linearization of, 3456
  - similarity conditions for, 2472

P

- **Particle accelerators,** betatron, 2291
    - e.s. deflection of beam, 1150
    - European, (B)2891
    - 15-in. glass toroid for, 471
    - 9-MeV, without iron yoke, 2015
    - 16-MeV, at Clarendon Laboratory, 1743
    - 20-MeV, 179, (D)2014
  - betatron and synchrotron, theory of, 178
  - centrifugal, electron-beam extraction for, 3222
  - cyclotron, f.m., pulsed oscillator for, 2017
    - 130-in., Rochester, r.f. system of, (A)1733
    - 184-in., e.m. beam deflector for, 472, r.f. system of, 2016
  - for electrons, cyclotron, 1151
    - development of, 2878
    - linear, microwave, 3225
  - linear, choice of operating mode, 1451
    - construction and feeds for, 175
    - design of, 177, 2595
    - dielectric-loaded waveguide for, 1744
    - resonant-cavity, 811
    - standing-wave type, 1452
    - travelling-wave, 176, for 4-MeV electrons, 1148
  - synchrotron, air-cored, 1149
    - design of pole faces, 3509
    - e.s. deflection of beam, 1150
    - for medical use, 3224
    - resonance effect in, 3508
    - 30-MeV, for medical research, 3223
    - 70-MeV, 2594
- **Particles,** charged, motion in field of a current, 2211
  - Fe, motion round wire carrying current, 74
  - nuclear, fundamental, (A)1639
- **Periodicals,** German, new, *Zeitschrift für Meteorologie* and *Deutsche Hydrographische Zeitschrift*, 918
    - recent developments, 269
- **Permeability,** a.c., of d.c.-magnetized transformer sheet steel, 755
  - decrease with increasing frequency, 1953
  - of ferromagnetic materials at u.h.f., 1409
  - of iron between 360 and 580 Mc/s, 2243
  - measurement, at u.h.f., 2841
- **Permeameters,** with demountable coils, 147, (C)774, h.f., 145
- **Phantastron** radar delay circuits, 2167
- **Phase** devices, applications of, 2454
  - difference, for two vertically spaced aerials, 1157
  - distortion, in coupled circuits, 1328
  - measurement, 434
    - at a.f., 3483
    - using c.r.o., 2852
    - for microwaves, 2560
    - for radiation from aerials, 2571
  - measuring equipment for video frequencies, 2836
  - meter, 446
    - a.f., wide-band, (A)1713
    - direct-reading, 2856
    - electronic, 1726
    - for frequency band 100 kc/s–20 Mc/s, 2002
  - shifters, resistive, 3204
  - splitter, incremental, 2864
- **Phosphors,** 1949
  - $CaSiO_3$-Pb and $CaSiO_3$-(Pb+Mn), 735
  - incomplete, electrical properties of, 109
  - infra-red-sensitive, inertia effects in, 1950
  - KI-Tl, quenching of photoluminescence of, 2242
  - organic, luminescence extinction of, 1682
  - silicate, for c.r. tubes, 1405
  - ZnO, temperature dependence of emission bands, 733
  - ZnO and ZnS-Zn, luminescence of, 1683
  - ZnS, (C)1404
  - ZnS-Ag, excitation time of, 108
  - ZnS-CdS, emission spectra of, 732, (D)734
  - ZnS-Cu and CaS-Bi, quenching of luminescence of, 3155
  - $ZnSiO_3$, 1951
- **Photocells,** AgS, 1534, 1535
  - barrier-layer, efficiency of, 900
  - capacitor method of investigating e.m.f., 1347
  - developments in Germany, 1939–1946, 2368
  - gas-filled, double, use in current stabilizer, 896
  - German research on, (B)1700
  - in industry, (B)2110
  - multi-layer, 2945
  - multiplier, (A)898
  - noise in, 897
  - PbS, 2370, (C)3299
    - comparison with photoemissive tubes, 1537
    - frequency characteristics of, 1536
    - high resistance, 3296
    - photoconductive, applications of, 2008
    - temperature coefficient of sensitivity, 2369
  - PbSe, 2072
    - photoconductive, 899
  - PbTe, effect of room-temperature radiation on infra-red response, 741
  - photoconductive, new, 1102
  - Se, efficiency of, 2371
  - sensitive, residual current in, 1225
  - synthetic-Bi_2S_3, 2073
- **Photoconductivity,** of semiconductor layers, 3578
- **Photoelectric effect,** of atomic layers of K, 2946
  - theory of barrier layer, 73
- —— **properties,** of CdS single crystals, 3440
- —— **voltages,** with intermittent light, 1915, 1916
- **Photoelectricity,** and its applications, (B)3600
  - investigations in Germany, 1939–1946, 2205
- **Photography,** motion picture, at 10^7 frames/sec, 1514
- **Photoluminescence,** of ZnS-Cu, 1684
- **Photometer,** recording, for c.r. tube displays, 1196
- **Physics,** reports on progress, 1946–1947, (B)368
- **Pickups,** gramophone, ceramic, 935
    - compliance meter for, 3331
    - valve, 616
- **Piezoelectric crystals,** (See also Crystals; Quartz)
  - α-quartz, constants of, 1685
  - EDT, with zero temperature-coefficient of frequency, 3165
  - production of, 1406
  - quartz, culture of, (A)411
- **Plasma** oscillations, 1644, 2175
- **Plastics,** conductive, (A)1681
    - Markite, 3443
  - development of fluorine chemistry, 736
  - electrical properties of, 2249
  - r.f. welding of, 3451
- **Popov, A. S.,** work of, (D)2113, (D)3315
- **Potential** dividers, d.c., use of cathode follower, 1004
  - function, calculation from asymptotic phase, 2776
- **Potentiometers,** a.c., 1436
  - for computing circuits, 782
- **Power** control, by electron-coupler valve at u.h.f., 2975
  - factor measurement for ceramics at 100 Mc/s and high temperature, 3455
  - measurement, absolute, for microwaves, 1727
  - for cm waves, with bolometer, 2860
  - heterodyne method for pulses, 2003
  - for microwaves, (A)1713, broad-band bolometers for, 3205

        broad-band methods for, 3195
    at 3000 Mc/s, 2840
  meters, (See also Wattmeters)
    r.f., using thermistor bridge, 441
    square-law recorder, 2572
    u.h.f., broad-band bolometer type, (A)451
    for 144 Mc/s, 2835
—— **supplies**, d.c., 500–50000-V, 1-mA, 2643
    stabilized, 30-kV, 3267, low-impedance, 3556
  d.c./a.c. thyratron converter, 3263
  for hum reduction in a.f. amplifiers, 677
  h.v., for G-M counters, 1195
    portable, 2919
    for radiation-measuring equipment, (A)1800
    r.f., theory of, 1807
    without transformer, 1199
  miniature, for counter tubes, 3266
  rectified a.c., for aircraft, 1803
  sealed ignitrons for, 556
  stabilized, 231, 863, 1200
  25-kV, for projection television receiver, 1808
Pressure gauge, piezoelectric, 2868
  measurement, electronic, 2589
Probability, random vectors, 1018
  random-walk problem, (D)685
Propagation constant, chart for cables, 1580
Protection, (See also Climatization)
  of Al, Framanol process, 125
  of components against moisture, 2813
Proton microscope, 1746, 2599
Pulses, amplification by gating methods, 2189
  in communication circuits, (B)2772
  generation of, 2180
  measurement of length and shape, 3480
  pressure, production by cavitation in water, 2689
  recurrence frequency deviation meter, 787

Q

Q, 2755
  measurement, for cavities at 10 kMc/s, 770
    for 2- and 4-terminal networks, 2266
  meter, accuracy improvement, 1992
    function and applications of, 1121, (D)2267, (D)2839
    for impedance measurement, 3192
Quadripoles, generalized, 1316
  linear, active, equivalent circuits of, 1315
    general theory of, 2467
  passive, synthesis of, 1886, 2745
  reactance, with given blocking points, 3366
Quality control, for receiving valves, 1117
  in valve manufacture, 2374
Quartz, β-, determination of elastic constants, 738
  twinning and etch figures, (B)2818
—— **crystals**, elimination of electrical twinning, 112
  experimental investigation of, 412
  large, production of, 1964
  mass-production of, 111
  measurement of characteristics, 137
  measurement of series-resonance resistance, 3202
  rectangular, elastic oscillations of, 2778
  rods, length oscillations of, 2777
  synthetic, (A)411
—— **plates**, l.f., frequency/temperature relations of, 1965

R

Radar, (See also Meteorology; Navigation aids) (B)407
  airborne, anti-collision, 728
  applications, high-speed X-ray motion-picture systems, (A)1733, 2600
  Canadian war-time research on, (B)3153
  corner reflectors, Meteorological Office Mark IIB, 1735
  Doppler, 2229
    for investigation of meteors, 2801
  echoes from meteors, 2213
  for ferries, 2803
  f.m., applications, 399
  forward-transmission echo-ranging system, (A)1672, 3140
  guided propagation in thunderstorms, 1478
  for harbour supervision, 2803
  for Liverpool channel, 729
  location of thunderstorms, 1676
  marine, 1677, 1942
    American views on operation of, (A)2803
    charts and chart matching devices for, 2803
    design of, 2803, 3146
    experience with, 2803
    fitting in ships, 2803
    improvement of echoes from buoys and small boats, 2803
    Kelvin-Hughes equipment, 1079
    operational factors, 2803
    operational value of, 2803
    the present outlook, 2803
    in U.S. ships, (A)2803
  for meteor detection, theory of, 1392
  minimum detectable signal, (D)398
  observation of heavy rain, 393, 1675
  p.p.i. calibrator, 2277
  primer, (B)2239
  principle of constant path-time difference, 1673
  principles and technique, 2524, (B)3150
  principles of volume scan, (A)1672
  problems, theoretical and practical, 104
  ranges, anomalous, 490, 492
  short-range m.c.w. position-finding system, 96, 1943
  for study of atmosphere, 2526
  for surveying, (AD)188
  systems, classification of, 1674
  technique of, (B)3152
  textbook of, (B)3151
  training devices, 2230
  for tropospheric sounding, 1760
Radiation impedance, of transmitter dipole, 1598
  from semi-infinite parallel plates, 1920, 2144
  shields, efficiency of, 1021, 1022, (D)1350
Radio, applications in meteorology, 1375
  engineering, (B)600
  equipment, for Services, design of, (D)2989
    in s.s. *Caronia*, 1799, 3553
  essentials of, (B)272
  outline of, (B)3604
  progress during 1948, 2112
  Research Board, work of, 2410
  technical problems of, purpose of J.T.A.C., 589
  technique, recent trends in, 2199
  at u.h.f., (B)923
Radio links, (See also Communication systems; Radiotelephony; Relay systems; Television)
  dm-λ, effect of noise on speech intelligibility, 2623
    planning of, 2049
  on French railways, 2911
  studio/transmitter, using klystrons, 220
  for television and multiplex R/T, (A)859
  u.s.w., diversity reception for, 1468
Radiometers, u.h.f., maximum sensitivity of, 1993
Radiosonde, Dutch, 3501
  for ozone content, 169
Radiotelegraphy, (See also Communication systems)
  carrier, frequency-shift, (D)1180
  commercial, point-to-point, (D)1182
  frequency-shift, 840
  inventor of, 2988
  multichannel, equipment for, 833
    h.f., 1500
Radiotelephony, (See also Communication systems)
  in America, 1503
  directional transmission in the Alps, 2326
  equipment, mobile, at Whitemoor marshalling yard, 2827
  France/Corsica, multiplex, 214, (C)1502
    use of reflector and e.m. lenses, 2145
  Great Lakes system, 1792
  links, u.h.f., multiplex, 1507, Milan/Rome, 1508, Zürich/Geneva, 215
  London overseas exchange, 218
  receiving system at Cooling, 3247
  s.s.b., double-diversity receiving equipment, 2898
    equipment of Dutch Post Office, (D)1183
    for ships, 1798
  on trains, 225
  Type 248A marine equipment, 229
  and the vocoder, 513
Reactance, variable, high-Q, 1010
Reactors, iron-core, graphical design of, 973
  saturable, 314
    for rectifier-voltage control, 2334
Receivers, (See also Television)
  for amateur bands, superheterodyne, dual-conversion, 3244
  a.m., signal/noise ratio in, (A)501, 1176
    thermal noise in, 1489
  broadcasting, acoustics of, 1267
    far-near device for, 2614
    Philips model 681A, 3245
    for Rural Radio Network system, 495
    s.w., high-fidelity, TR.138, 3243
  communication, G.E.C. Model BRT 400, 2310
    tropicalized, Redifon Model R50, 2899
  with c.r.o., for ionosphere sounding, 2069
  d.f., band-pass circuit design for minimum bearing error, (A)1672
  dm-λ, amplifier and mixer stages, sensitivity of, 2312
  double-diversity, for s.s.b. R/T, 2898
  f.m., design problems, 1169
    discriminator alignment in, 199
    phase discriminator for, 1001
    specification of, 494
    transient response of, 1485
    with ultrasonic control, 3529
  f.m. and a.m., signal/noise ratio in, 2619, (C)3532
  frequency-shift, for naval facsimile, (A)1785
  hum reduction in, (A)2496
  input circuits, noise figures for, 2315
  microwave, (B)206
  noise factor, theory of, (A)1769
  production-cost reduction, 3531
  radar, anti-clutter, 1172
  radiotelegraphy, 2041
  sensitivity with complex aerial resistance, 2900
  s.s.b., Marconi Type CRD. 150/20B-SSR.2, 1771
  superheterodyne, Eddystone Type 680, 3530
    tracking in, 1173
    v.h.f., crystal-saving circuits for, 497
  superregenerative, design of, 499
    impulse interference in, 2618
    optimum selectivity in, 2613
    performance of, 2617
  synchrodyne, 3533
  telecontrolled, tunable, 2884
  u.h.f., noise measurement for, 2833
    standard, 793
  u.s.w., circuit design for, 1174
  v.h.f., single-channel for airports, 201
  1949 diagrams and servicing information, (B)2317
Reception, (See also Field strength; Television; Wave propagation, e.m.)
  diversity, and s.w. fading, 823
    for u.s.w. links, 1468
  extraction of weak signals from noise by integration, 2612
  f.m., using superregenerator in nonlinear mode, 1483
  heterodyne, 2330
  interference-free, using aerials with screened down-leads, 2624
  panoramic, 1770
  phase difference for two vertically spaced aerials, 1157
  simultaneous, of several signals on single aerial, 3535
  and sunspots, 1944–1947, 1035
  superregenerative, analysis of linear mode, 2309
  technique, manual of, (B)2904
  v.h.f. and u.h.f., limitation by noise, 1487
  at 45-Mc/s, effect of reflections from aircraft, 1486
Recorders, frequency response characteristics of, 2561
  ionospheric, 789
    with repetition-frequency converter, 1438
  watch-rate, 1710
Rectification, at boundary between semiconductors, 1412
  by insulating layer, theory of, 1096
  of modulated carrier in presence of noise, 1175
  at Si and pyrite surfaces, 1952
  theory of, (A)1681
  valve, 2330
Rectifiers, (A)2814
  crystal, background noise of, 2976
    carborundum, nonlinearity of V/A characteristics, 1962
    at u.h.f., 25, 2761
  Cu_2O, 2645, for measurement of small a.c. voltages, 3187
  dry, boundary-layer theory of, 2917
  gas-valve, circuit analysis for, 323
  German research on, (B)2922
  initial surge reduction in, 1870
  metal, (B) 3269
    German research on, (B)1700
  oxide, h.f., 2330
  using relay tubes, commutation in, 2053
  semiconductor, optimum performance of, 2452
  small, constancy of, 657
  valve, high-vacuum, oxide-cathode, 531
  voltage control by saturable reactors, 2334
Reflection, at dielectric in waveguide, 3038
  of e.m. waves, from curved surface, 816
    from flat and corner reflectors, 1162
    at inhomogeneous layer, 3231
  of sound, by porous media, 1850
  of spherical waves, theory of, 3117
  total, in magnetic media, 1755
Reflectometer, for waveguides, 1729
Refraction, double, of e.m. waves in ionosphere, 3232
  normal and abnormal, u.s.w., in troposphere, 2031
Regulating systems, stability and efficiency of, 2331
Regulation, automatic, bibliography of Russian articles, 1917–1947, 1513
Regulators, degenerative, (A)1800
  signal-level, for carrier systems, 2338
  voltage, electronic, 2646, stability of, 2333
    glow-discharge, characteristics of, 1804
    for 250-VA 400-c/s inverter, 860
Relay systems, (See also Communication systems; Radio links; Television)
  broad-band, microwave, New York/Boston, 1793, repeater buildings for, 221
  intercity, for television, (A)1785
  microwave, indirect, 219
    for television, New York/Philadelphia, 1185, (A)1785
Research, on non-ferrous materials, at General Electric laboratories, 2993
  work of S.C.E.L., 2111
Resistance device, frequency-independent, s.w., 28
  h.f., of coils, 658
    measurement accuracy, 129
  measurement, valve megohmmeters, 153, 3479
  of thin metal films at cm λ, 766
Resistors, carbon, for h.f., 318
    high-stability, 27
    precision, 317
    pyrolytic, 1874
  fixed, for communication equipment, 2735
  loss-angle measurement for, 1122
  nonlinear, characteristics of, 1875
  standard, new materials for, 1690
Resonance frequency, of reradiating structures, measurement of, 1128
Resonators, acoustic, absorption coefficient of, 1264
    coupled, theory of, 1841
  cavity, Bessel-equation roots for calculating frequencies of, 417
    cylindrical, measurements on, 997, reentrant, frequency calculation for, 2149, (C)2444
    elimination of low frequencies, 1330
    excitation and coupling of, 1621
    forced e.m. oscillations in, 995
    for frequency reference at λ 3 cm, 1331
    frequency stability of, 992, 993
    for generation of microwaves, 2477
    impedance measurement for, 1719
    irregular, natural frequencies of, 996
    perturbed, nodal planes in, 994, 3092
    radiation of oscillations through aperture, 1329
    resonance-frequency measurement for, 1437
    solution of Maxwell's equations for field in, 3091
    spherical, excitation by dipole at centre, 3050, frequency constancy of, 987
    tunable, for reflex klystrons, 2476
    use in mobile communications equipment, 3378
  vocal, artificial, experiments with, 3012
Response curve tracer, very-wide-band, u.h.f., (A)777

S

Sampling, systematic, 761
Scale, for a.f. plotting, 3319
Screening, efficiency of shields in series, 1021, 1022
Screens, (See also Cathode-ray tubes)
  fluorescent, for electron microscope, 2293
  luminescent, for c.r.o., (A)445
Seals, ceramic/metal, (A)1681
  glass/metal, 1974
    tubular, stresses in, 1419
    2-wire, stresses in, 113
  quartz/metal, 1420
  for transmitting-valve leads, 1975
Semiconductors, (A)413, (A)2814, (A)3442
  and complex derivatives, theory of, 3445
  electronic, physics of, 740
  Ge, dependence of resistivity on electric field, 1088, 3438
    electrical conductivity of, 2811
    non-rectifying, 742
  Ge and Si, metallurgy of, (A)1681
    properties of, (A)1681
  German research on, (B)1700, (B)2922
  and metals, boundary layers between, 1411
  photoconductivity of, 3578
  photoelectric emission and contact potentials of, 1098
  properties of (Ba,Sr)O, 3444
  rectification at boundary, 1412
  SiC, 3168
  temperature dependence of resistance of, 3169
  TiO_2, thermoelectric and conductive properties, 116
  variation of properties with vapour pressure, 115
Sensitivity limit, for basic valve circuits, 3362
Servicing, of f.m. and television receivers, (B)511
  radio, theory and practice, (B)3396
Servo systems, suppressed-carrier, bridged parallel-T network for, (A)1612
Servomechanisms, carrier-frequency, stabilization of, 857
  characteristics of human operator, 2329
  closed-cycle systems, nonlinearity in, 2329
    stability of, 2329
  clutch-type, control of, 2641
  comparison of two basic types, 854
  for control of testing machine, 530
  and data-transmission systems, small, testing of, 2329
  dimensional analysis of, 853
  electrical remote position-indicating systems for aircraft, 2329
  hydraulic remote position-controllers, 2329
  linear, analysis of, 2329
    analysis and synthesis of, 855
  performance of, 2640
  principles of, (B)2921
  rototrol, 1193, 2918
  stability criteria, 1193
  stabilization of, 856
  technique, 1194
  theory of, (B)232
Signal generators, a.f., 792, 2857, 3487
  a.m., low-distortion, 2275, 2574
  broad-band, 4–10-kMc/s, 2576
  precision timing-marker, (A)1713
  for servomechanism measurements, 2573
  standard, variable-frequency, 157
  for television synchronization, 448
  u.h.f., standard, 793
Signal/noise ratio, in a.m. receivers, 1176
  in communication systems, (A)1769
  for different modulation systems, 3547
  in f.m. and a.m. receivers, 2619, (C)3532
  improvement by integration in storage tube, (A)1769
  in p.c.m. systems, 3552
  in p.m. systems, 502
  in radar, (D)2042
Signals, quantized, spectra of, 895
Similitude, principle of, electrical applications of, 60
  of valves, 902
Skin effect, anomalous, relaxation in, (D)3403
  in conductors and in insulators with conducting surface layer, 3402
  h.f., at low temperatures, (A)360
    in metals, theory of, 1354
  in steel sheets, 1353
Solar activity, (See also Sun; Sunspots)
  flare, and noise at 9500 Mc/s, 697
  flares, 376
    and phase of very long reflected radio waves, 3416
    and terrestrial effects, 2512
  and geomagnetic storms, 82, 1369, 1653, Oct.–Dec. 1947, 371, in 1948, 1923
  and ionosphere critical frequencies, 1051
  maximum for current cycle, 1034
  prominences, in 1947, 1038
  22-year cycle, 1372
—— **cycle**, and geomagnetic storms, 1657
—— **magnetism**, and Blackett's theory, 1040
—— **noise**. See Solar radiation, r.f.
—— **physics**, 1373
—— **radiation**, r.f., (A)372, 1367, 1368, 2509, 3413
    abnormal, 8th May 1949, and associated phenomena, 3129
    circularly polarized, λ 10.7 cm, 2215
    dm-λ, perturbations, 698
    origin of, 696, (A)1652, 3412
    pulse shape of, 77
    Royal Astronomical Society discussion, (AD)374
    spectrum of, 1366
    on λ 1.7 and 3.8 m, (A)373
    λ 50 cm, during eclipse of 1st Nov. 1948, 3417
    10.7-cm, correlation with sunspots, 2511
    between 6.7 and 25.6 Mc/s, 2510
    at 158 Mc/s, 2214
    at 9500 Mc/s, and coincident flare, 697
—— **research**, optical methods, review, 1363
—— **system**, origin of, 1030
Soldering, brazing and welding, German methods, 2253
Solids, relations between properties of, 3162
Sonar, bearing deviation indicator for, 725

  in harbour defence and landing operations, **1670**
  for submarine detection, **728**
Sound (See also Absorption; Acoustics)
  analysis, by electrical methods, **1256**
    with photoelectric spectrograph, **1844**
    with ultrasonic plate spectroscope, **2698**
  analysis and synthesis of musical notes, **3323**
  attenuation, in absorption tubes, **2695**
    in fog and smoke, **614**
  diffraction, through circular aperture, **2690**
    Kirchhoff approximation in theory of, **2691**
  energy measurement, comparison of methods, **617**
  field, of aircraft propeller, **2687**
    of circular membrane in rigid wall, **2415**
    of piston membrane, **2999**
    of point source in perfect fluid, **1839**
  intense, biological effects of, **(A)933**
  loudness matching of short tones, **3013**
  propagation, in composite media, **2686**
  in compressible media, **1565**
    within cylinders of liquid, **2688**
    ray geometry for stratified media, **2996**
  quality, masking of multiple tones by noise, **3011**
    in wire-broadcasting systems, **2424**
  radiation, into circular tube, **1608**
    from diaphragm struck periodically, **606**
    from finite cylinder, **2685**
  receivers, piezoelectric, equivalent circuit for, **3020**
  reflection, by porous media, **1850**
    from submerged plates, **611**
  sound-level meter, miniature, **2418**
  spectrum variations, subjective effect of, **3007**
  survey, **1251**, **1252**
  transmission, through homogeneous walls, **3326**
    through metal plates at oblique incidence, **2998**
    through multiple structures, **2997**
    and noise, **604**
  velocity, in air at low pressures, **3009**
    in free air, **927**
    in superheated steam, **1840**
  and vibration, **(B)279**, **(B)1575**
—— **recorders**, magnetic, G.E.C. model, **3330**
    high-quality, Model 200A, **278**
    noise in, **2710**
    portable, R.C.A. Type RT-3A, **2709**
    quality of, **(A)2423**
    35-mm, **633**
—— **recording**, B.B.C. methods, **11**
    disk, **(B)1577**, **3328**
    for broadcasting stations, **1856**
    crossover filter for cutter heads, **2470**, **3085**
    design of balanced-armature cutter head, **2131**
    high-fidelity, **(D)942**
    light-pattern meter for, **624**
    33⅓-r.p.m. 300 grooves/inch system, **277**
  on film, volume compressors for, **1270**
  magnetic, **943**, **(B)3332**
    edispot for editing, **12**
    field of ring recording head, **636**
    linear, with high-frequency excitation, analysis of, **2133**
    optimum high-frequency bias for, **635**, **3031**
    spurious printing in tapes, **3030**
    stereophonic, **2132**
    tape characteristics, **2422**, **3029**
    technique of, **3329**
  proposed distortion measurement standards, **791**
  stereophonic, for the cinema, **1846**
    for duplicating concerts, **1572**
—— **reproduction**, **632**, **(A)1563**
  contrast expansion circuits, **2171**, **(C)2753**, **(D)3086**
  disk, **3328**
    high-fidelity, **1574**
    noise suppressor, dynamic, **275**, **625**
    tracing distortion, **2705**, analysis of, **2704**
    wow measurement, **1570**
  film-scanning device, **2420**
  gramophones, record changer and complementary record, **2711**
  listeners' preferences, **1266**, **(D)2125**
  stereophonic, for the cinema, **1846**
    for duplicating concerts, **1572**
    for halls, **2703**
    magnetic, **2132**
  for television, technique of, **(A)1563**
  tone control, **944**, circuit for, **1272**
Space charge, effects in beam tetrodes, **(D)573**
  in whole-anode magnetron, **260**
Spectrometer, grating, for mm λ, **1131**
  mass, r.f., **797**
  recording, infra-red, **459**
  for λ 10 cm, with mechanical sweep, **2855**
Spectroscope, plate, ultrasonic, for sound analysis, **2698**
Spectroscopy, microwave (See also Absorption, microwave) **456**, **3125**
Speech, effect of high altitude on, **622**
  intelligibility, in deafness or loud noise, **(D)1261**
    effect of noise in dm-wave links, **2623**
  measurement of intensity distribution, **1262**
  spectra, artificial voice, **1263**
  transmission, new possibilities, **(D)274**
  visible, playback apparatus for, **3**
Stability criterion, for analogue calculators, **3348**
    for control circuits, **3347**
    for linear systems, **3127**
Stabilization, frequency, automatic, of f.m. oscillator, **26**
    of diathermy unit, **1142**
    of f.m. u.s.w. transmitters, **1221**
    microwave, **136**
    of microwave oscillators by spectrum lines, **1606**
    for railway signalling power supplies, **3265**
    of v.m. valves, **2104**
  of mains voltage, **3268**
  voltage, for electron microscope, **1805**
Stabilizers, frequency, electronic, **2335**
  voltage, **3555**
    magnetic, design of, **3264**
Standard frequency (See also Frequency)
  spectra, dense, technique of, **2570**
  transmissions, British, **134**
    WWV, reception in Turin, **135**
    from WWVH, Hawaii, **1982**
Standardization, of components by A.S.E.S.A., **2445**
Standards, (See also individual subjects)
  attenuation, microwave, **(A)1730**, **2578**
  capacitance, 0.001–5pF, **1439**
  capacitance, inductance and frequency, **1715**
  for microwave measurements, **1995**
  radio, **(A)452**
Statistics, theory of error distribution, **1939**
Stopclock, electronic, **2259**
Stratosphere, (See also Atmosphere)
  middle, O_3 content of, **(A)714**
Stratovision, for broadcasting, tests in U.S.A., **233**
Strobe principle, in radio and radar, **31**
Studios, (See also Broadcasting studios)
  for sound recording and reproduction, **2126**
Sun, angular momentum of, **695**
  recent investigations, **1651**
Sunspots, and associated magnetic and electrical phenomena, **78**
  frequency of, tables and graphs for 1749–1948, **690**
  and geomagnetic activity, **(A)1370**, **1924**
  location in 1941, **1371**
  provisional numbers, Oct.–Dec. 1947, **375**, Jan.–June 1948, **701**, July–Sept. 1948, **1037**, Oct.–Dec. 1948, **2216**, Jan.–March 1949, **3415**
  and radio reception, 1944–1947, **1035**
  relative numbers, final, for 1947, **700**, for 1948, **3414**
  in 1947, **1036**
  on 22nd Jan. 1949, and magnetic storm, **1654**
Superconductivity, **1355**, theory of, **68**
Superconductors, CbN, r.f. properties of, **2531**
  Sn, h.f. resistance of, **69**
Supports, coaxial-line, for 0–4000 Mc/s, **1582**
Surveying, with pulsed light, **2601**
Switches, channel, for television receivers, **2066**
  electronic, for diversity reception, **1878**
    speed of, **(A)1612**
    with variable period, **30**
  microwave, duplex, **(B)354**
    using secondary emission, **3358**
    Type 1B25, admittance of, **3071**
  multi-position, rectifier networks for, **1609**
Symbols, graphical, for circuits, **664**, **2164**
Synchronization, in broadcasting networks, **527**
  of controlled relaxation oscillators, **668**
  of distant transmitters and frequency standard, **2071**
  of facsimile transmitter and receiver, **2925**
  for p.c.m. receiver, **1768**
  of relaxation oscillations, **2734**
Synthesiser, harmonic, mechanical, use in filter analysis, **3373**

T

Tachometers, for high speeds, **468**
Telecommunications, amplification centres, power supplies for, **1495**
  efficiency of, **(AD)3197**
  long-distance underground lines, maintenance of, **1494**
  networks, French, **1492**, future of, **1496**
  repeater-station equipment, **1493**
  services, overseas, in Australia, **2627**
  for 1948 Olympic Games, **828**
Telecontrol, electronic, of artillery, **3515**
  of model boats and cars, **2021**
  of receiver tuning, **2884**
Telegraphy, multiplex, stabilized oscillator for, **209**
  service, for 5th Olympic winter sports, St. Moritz, 1948, **2318**
  voice-frequency, **208**
Telemetry, **3184**
  equipment for carrier-current channels, **2588**
  for guided missiles, **425**, **805**
Telephony, European switching plan, **920**
  systems, multiplex, p.m., **845**
Teleprinting, by radio, **1501**
Television, (See also Aerials; Interference) **(B)2357**
  aerials, directive, reversible-beam, **2720**
    receiving, **2718**
  aerials and distribution systems for apartment houses, **243**, **2339**
  a.f. technique, **1851**
  in an airliner, **1209**, **1441**
  amplifiers, i.f., design of, **1635**, stagger-tuned, design of, **3394**
    video, stagger-peaked, **1344**
  anastigmatic yoke for c.r. tubes, **(A)1810**, **3570**
  in Britain, **891**
    B.B.C. service, **881**
  broadcasting of meteorological charts, **(A)868**
  cameras, **(A)1810**
    ériscope, **537**
    image orthicon, development of, **2924**
    medium-definition, **234**
    recording, **236**
    slow-electron, **3270**
  in the cinema, **1523**, **2057**
  and the cinema, relations between, **(A)878**
  colour, chromoscope viewing tube, **539**
    new system, **(A)871**
  colour measurement and specification in picture tubes, **538**
  consoles, design of, **883**
  c.r. tubes, operating conditions *vs* picture brightness, **2648**
    R.C.A. Type 16AP4, manufacture of, **2341**
  definition, **3272**
    and bandwidth, **542**
    comparison with cine-film, **(A)876**
  development in Russia, **1207**
  distortion of scanning waveforms, **3271**
  electro-optics of camera systems, **540**, **1516**
  equipment, for broadcasting stations, **889**
    London/Birmingham cable, **1279**, **1857**
    mobile, WDTV, **2349**, WMAL-TV, **2064**, WOW-TV, **2348**
    Philadelphia/Pittsburgh/Cleveland coaxial cable, **1581**
    for 1949 Oxford and Cambridge boat race, **2343**
    729-line, **(A)873**, **2927**
  extension sound and vision units, **1216**
  framing-signal separation, **1205**
  French work on, **1525**
  frequency and modulation monitor, **450**
  fundamental principles of, **(B)1218**
  and its industrial outlook to-day, **(A)874**
  interference, due to aircraft, **2068**
    from ignition systems, **2355**, **2937**
    patterns, **2354**, **3574**
    reduction of, **2356**, **2938**
  line standard, in France, **872**, **2344**, reasons for choice of 819 lines, **(A)880**, **2345**, **2346**
  low-cost operation at New Haven, **2351**
  measurement of phase constants and group velocity, **(A)882**
  modulation measurement, **(A)1810**
  monitor receiver, **3488**
  multipath effects in, **3527**
  p.c.m. for, **(A)1785**
  projection, in cine-theatres, c.r. tube screens for, **3562**
    correction plates for Schmidt system, **63**, improved, **2650**
    equipment for home receivers, **3274**, **3275**
    large-screen, **(A)886**, **2651**, demonstration at Philadelphia, **2652**, developments in, **237**, optical problems in, **238**, use of eidophors, **(A)875**, **3561**
    screens for stereoscopic pictures, **3273**
    for theatres, in England, **240**
  propagation problems, *ad hoc* committee report on, **3524**
  receivers, a.g.c. circuits, **351**, **352**
    channel-switching mechanism, **2066**
    construction of, **(B)2358**
    design for prevention of radio interference, **205**
    front-end design, **544**, **2350**
    home-built, **1214**
    input circuits for, **510**, and transit time effects, **3113**
    Motorola Model VT-71, **1526**
    Philco, design, engineering and manufacture of, **1213**
    post-war design of, **885**
    projection, deflection circuits for, **2934**, optical system for, **1815**, synchronization for, **3569**, 25-kV supply for, **1808**
    with rimlock valves, a.f.c. and a.ph.c., **3280**
    superheterodyne, **1527**, **1811**, with station selection, **2933**
    without transformers, 4-unit design, **2658**
    tuned r.f., design of, **3281**
    u.h.f., converters for, **3568**
    video amplifiers, pentode, **682**
    for 450-line or 819-line transmissions, **2065**, using miniature valves, **2932**
  and recent developments in u.h.f. valves, **(A)904**, **1545**
  recent progress, **1517**
  reception, in Calais, of London transmissions, **547**
    field contours for B.B.C. transmitter, **1519**
    field-strength surveys, **3525**, u.h.f., near Washington, **1490**, **(A)1757**, **3526**
    first practical tests in Switzerland, **2352**
    survey for New York metropolitan area, **2353**
  recording, simplified system, **3278**
    technique of, **2655**
    transcriptions on film, **235**, **543**
  relay system, inter-city, **(A)1785**
    microwave, **851**, **(A)1785**
    New York/Schenectady, **2347**
    video design considerations for, **(A)1785**
  scanner for moving colour-film, **869**
  scanning system, asymmetrical-aperture, **3559**
    design, **1204**
    'knight' method, **(A)870**
  shutterless film projector for, **1212**
  sound technique for, **(A)1563**
  standardization, for Europe, **1524**
  standards, in Germany, England and U.S.A., **1210**
    international, **3567**
    present-day, in U.S.A., **3566**
    proposed, for Italy, **(A)879**
  stations, and networks, in U.S.A., 1949, **2067**
    practical equipment for, **1817**
    site-testing equipment for, **3573**
    WCAU-TV, Philadelphia, **2936**
    WENR-TV, Chicago, **2935**
    WPIX, New York, **242**
  studio technique at Alexandra Palace, **3284**
  for surgery instruction, **3276**
  sweep circuits, a.f.c. for, **2336**
  synchronization, by locked oscillator, **1206**, **2649**
  synchronization separator, **2926**
  technical and production problems, **(A)890**
  test gear, standard-signal distribution system, **1984**
  for theatres, intermediate-film system, **2653**
  timebase linearization, **3098**
  in trains, **1814**
  transmission system, polycast u.h.f., **2056**
    wide-band, **2342**
  transmitters, carrier synchronization for, **(A)1810**
    design of, **138**
    grid modulation and cathode excitation for, **(A)884**
    standardization of transient response, **2063**
    WOR, **3571**
    WPTZ, transient-response tests on, **(A)1810**
    for 500–900 Mc/s, **1531**
  u.h.f., **(A)1810**
  in U.S.A., **1211**
  use in cinematographic recording, **(A)877**
  v.h.f., propagation problems of, **(A)1757**
  waveform standards, British and American, **1208**
  6 German papers translated, **1819**
  1948 Paris congress, **865**, **866**, **3560**
  1948 Zürich conference, **867**
Temperature control, electronic, in communication engineering, **861**
  gradient, vertical, in lower atmosphere, **3136**
Test equipment, a.f. response curve tracer, **148**
  for aircraft radio apparatus, **3490**
  balance for tests on permanent magnets, **3470**
  beat-frequency oscillator, 50 c/s–200 kc/s, **3208**
  for carrier-current systems, **1127**
  for d.f. systems, **2575**
  for faults in coaxial cables, **431**
  for radar, incremental phase splitter, **2864**
  for television receivers, **(A)795**
    crosshatch generator, **1133**
  for television-station sites, **3573**
  television synchronizing signal generator, **448**
  for transistors, **2863**
Testing, climatic and durability, specification RIC/11 for radio components, **2279**
  of materials, German electronic methods, **(B)2819**
  of metals, non-destructive magnetic and inductive, **2245**
  shock, high-impact, **1440**
  vibration, of aircraft structures and equipment, **1737**
Thermistors, **3068**, **3354**
  properties and applications of, **2156**, **3353**
  for thermometry and anemometry, **3355**
  UO_2, **2250**
Thermocouples, radiation, dynamic impedance and sensitivity of, **3484**
Thickness gauges, using radioisotopes, **(A)1733**, **3498**, X-ray, **2579**, **2580**
Thunderstorms, radar observations of, **392**
Time, chronoscope, c.r., for intervals 10 μs to 0.1 μs, **1111**, spiral-trace, for times up to 12 ms, **133**
  measurement, by c.r.o., **444**
    electronic, **(B)3491**
    by electronic stopclock, **2259**
    for rapid phenomena, **141**
    timer, electronic, 0–0.02–0.1–0.5–5 sec, **2830**, process, electronic, **172**, for radioactivity measurements, **3210**
  signals, standard, comparison of, **1428**, equipment at Dominion Observatory, N.Z., **1711**
Timebases, linear, resistance-charged gas relay, **1900**
  Miller, **1625**
  spiral, **2758**
Timing circuit, chronotron-type, **2829**
Torquemeter, magnetostriction, **463**
Transducers, using activated ceramics, **(A)1269**
  crystal, theory for plane waves, **2707**
  electroacoustic, **1852**
    basic types, **3320**
    classification of, **940**
    impedance variations in reflecting field, **629**
    linear, passive, theory of, **(A)939**
    magnetostrictive, low-Q, **3022**
  electrokinetic, **938**
  electromechanical, **(B)2712**
    using $BaTiO_3$, **3439**
  magnetostrictive, lamination design for, **628**
    100-kc/s, **627**
  piezoelectric, **2128**, **3021**
  standard, calibration of, **619**
Transductors, (See also Amplifiers, magnetic)
  fundamentals of, **313**
  for rectifier control, **3065**
  theory of, **656**
Transformers, a.f., design of, **1607**
  air-cored, design charts for, **2725**
  double-tuned, design of, **2726**, **3063**
  equivalent circuits for, **1613**
  i.f., design of, **2153**
    measurements on, **3193**
  impedance, coaxial and twin-conductor, **1885**
  impedance measurement by bridge methods, **2263**
  modulation, high-power, design of, **968**
  output, a.f., design of, **1008**
    design diagrams for, **970**
  power, small, for aircraft, **3349**
  pulse, design of, **2154**
  screened, symmetrical, for h.f. d.f., **969**
  theory and equivalent circuits for, **1872**
  u.h.f., adjustable, for impedance matching, **961**
  voltage-drop measurements for, **3464**
Transient response, of linear systems, and pole and zero locations, **2165**
  of networks, equalization of, **2166**
Transients, in communication circuits, **(B)2772**
  in detection, **1301**
  fast, photography of, **2724**
  in low-pass filters, **3081**
  in networks, **(D)350**
  in oscillatory circuit, **3090**
  study by means of time series, **3175**
Transistor, (See also Oscillators) **(A)2680**
  as amplifier and oscillator, **912**
  circuits for, **1905**
  coaxial, **2406**, **2407**
  double-surface, **2108**
  Ge, **1968**
    hole current in, **3599**
  mechanism of, **2109**
  physical principles of, **(A)1681**, **2979**

  - semiconductor triode, **264, 265, 581, 582, 913, 914, 915**
  - test equipment for, **2863**
  - tetrode mixer, **3597, 3598**
  - type-A, **2404, 2405**
- **Transistron**, French analogue of transistor, **2978**
- **Translators and translations**, directory of, **3316**
- **Transmission** measurement, equipment for communication circuits, **767**
  - systems, band-limited, **(A)1785**
    - microwave, efficiency measurement for, **3196**
  - of wide a.f. band, fundamental principles of, **1787**
- —— **lines**, abacs for, **1274**
  - beaded, propagation in, **285**, design of, **1582**
  - coaxial, use in low-pass filters, **680**
  - delay, for travelling-wave amplifiers, **39**
  - h.f., impedance and attenuation calculation for, **3333**
  - impedance measurement for, **2264**
  - for impedance measurement at dm λ, **3203**
  - multi-conductor, computation of, **1282**
  - overhead, abacs for tension, sag etc. of, **3033**
  - polyphase, h.f., **637, (C)1579**
  - reflections from obstacles at u.h.f., **1280**
- **Transmitter-receivers**, electrical switching for, **2908**
  - T.R.1143, modification for amateur use, **1786**
- **Transmitters**, (See also Television)
  - a.m., 150-kW, **3288**
  - amateur, push-pull, **555**
    - s.s.b., filter design for, **3290**
    - 10-m, **1530**
  - automatic change-over to emergency apparatus, **2323**
  - broadcast, a.m., performance with sharply-tuned aerials, **3291**, 50-kW, for KOMO station, **1222**
    - f.m., for Rural Radio Network system, **551**; WOR, **3571**; 250-W, **1220, 2939**; 50-kW, **549**
    - German, war-time development of, **2359**
    - m.f., 1-kW, **1529**; 200-kW, Swiss, **554**
    - at Villebon, Rennes and Lille, **1820**
    - 5-kW, Norwich, B.B.C., **2942, 3256**
    - 100-kW, Naples, **3292**
  - crystal-controlled, portable, for 25–32 Mc/s, **550**
  - f.m., control of frequency deviation, **3576**
    - u.s.w., frequency stabilization of, **1221**
  - frequency control of, **2070**
  - h.f., for d.f. measurements, **1941**
  - high-power, output-stage stability of, **2940**
  - keying from great distances, **1223**
  - Marconi, Type TGM.571, m.f., 500-W, **1219**
    - Types TGM. 651 and TGZ.651, m.f., 3-kW, **3289**
    - Type TGS.571, 2.5–20 Mc/s, **553**
  - pulse, for ionosphere sounding, **2069**
    - u.h.f., high-power, **2360**
  - modulation systems for, **(A)1533**
  - spark, for cm λ, **2175**
  - s.s.b., high-power, **893**
  - s.w., Type SK23A, 300-W, **552**
  - telegraphy, long-wave, valve loading and signal shape for, **2660**
    - s.w., 10-kW, **245**
  - telegraphy/telephony, for aerodromes, **270**
  - television, design of, **138**
    - WPTZ, transient-response tests on, **(A)1810**
    - for 500–900 Mc/s, **1531**
  - u.h.f., multiple operation of output valves in, **(A)1810, 2943**
- **Transmitting stations**, amateur, R.S.G.B. headquarters', GB1RS, **1796**
  - radio, Criggion, **852**
- **Troposphere**, (See also Atmosphere)
  - charts for determining refractive index of, **3422**
  - reflection of e.m. waves in, **2605**
  - sounding by radar, **1760, 3520**
- **Tuners**, f.m., fixed-frequency, **1911**
  - stub, for power division, **57**
- **Tuning devices**, 12-position click gear, **2941**

U

- **Ultrasonic** absorption. See Absorption.
  - applications, determination of elastic constants of solids, **1732**; flaw detectors, **804, 1447, 2286**; in Germany, **1461**; tinning of Al, **2282**
  - generators, (See also Generators) **2281**
    - use of $NH_4H_2PO_4$ crystals, **929**
  - interferometer with resonant liquid column, **930**
  - lenses, plastic, **3006**
  - oscillations, f.m., use for acoustic absorption measurements, **2693**
  - radiators, spherical-shell, **3003**
  - waves, generation in liquids for industrial purposes, **1442**; in liquids, modulation by e.s. field, **3321**; scattering in water by cylindrical obstacles, **609**; velocity variation with temperature, **3002**; visual demonstration of paths, **2119, 2369**
- **Ultrasonics**, **(B)1576, (B)3032**
  - and electrostriction, **1843**
  - experimental, **1842**
  - high-intensity, for biological applications, **2694**
  - intensity gain due to concave reflectors, theory, **3004**, experiment, [illegible]
  - for location of lost torpedoes, **2523**
  - opacity of porous media, **2696**
  - use for detecting infra-red radiation, **273**
  - velocity and absorption measurements in gases, **2118**
  - wave propagation in solid rods, **1567**
  - 100-kc/s transducer, **627**
- **Units**, **(D)683**
  - electrical, change from international to absolute system, **3398**
    - developments in last 100 years and change to absolute units, **3397**
    - review of, **3399**
  - e.m., and definitions, **684**
  - in Giorgi and c.g.s. systems, **1640**
  - Giorgi system, origin of, **356**
  - rationalization of, **2775**
  - rationalized Giorgi system, **1846**
    - with absolute volt and ampere, **1017**

V

- **Vacuum** gauges, hot-wire, **731, 2528**, direct-reading, **1947**
    - ionization type, **1948**
    - radiometer-type, **2240**
    - for 10^{-1} to 10^{-6} mm Hg, **730**
  - pumps, **2241**
    - molecular, design calculations for, **3154**
  - systems, seals and valves, **409**
  - technique, **1403**
    - bridge manometer, **1064**
    - scientific foundations of, **(B)3174**
    - testing for residual gas, **(A)1681**
- **Valves**, (See also Transistor; Transistron)
  - amplifier, for broadcasting, optimum operating conditions for, **2662**
    - l.f. noise from, **574**
  - battery, miniature, Tungsram, **1237**
  - beam-tetrode, anode/screen-grid space in, **1235**
    - space charge effects in, **(D)573**
  - B.R.V.M.A. recommendations for obtaining optimum performance, **(A)901**
  - calculation of electrode temperatures in, **1228, (D)3302**
  - characteristics, dynamic methods for, **256**
  - cold-cathode, potassium-activated, **3586**
  - cooled-anode, **(A)1826**
  - with cylindrical electrodes, space-charge effects in, **2384**
  - design, and circuit requirements, **2378**
  - design trends, **1227, 2663**
  - developments in Germany, 1939–1946, **557, 2368**
  - development review, **1538**
  - diode, cylindrical, retarding-field current in, **2960**
    - effect of hydrostatic pressure on electron flow, **566**
    - h.f. total-emission loading in, **2959**
    - noise characteristics for large transit angles, **2387**
    - nonlinear distortion and noise in, **2386**
    - with oxide cathodes, characteristics of, **2099**
    - plane, current fluctuations in, **2673**
    - with retarding field, noise spectrum of, **2098**
    - saturated, flicker effect in, **2958**
    - standard, for oxide-cathode core-material tests, **2675**
    - temperature-limited, noise spectrum of, **2097**
    - test, design of, **2672**
  - double-beam, amplification in, **2977**
    - analysis for, **1540**
    - design and construction of, **2487, 3388**
    - solution of equation for, **(A)1824**
    - theory of, **1583, 1825, 2486, (D)3300**
  - double-triode, a.f.-input, low-noise, **3303**
  - dyotron, as v.h.f. oscillator, **(A)2676**
  - electrometer, **1236, 2376**
    - and circuits, **(A)1824**
    - fluctuations in, **1123**
    - noise reduction in, **1997**
    - subminiature, **2967**
  - electron-coupler, for a.m. and power control at u.h.f., **(A)1824, 2975**
  - electron-wave, **1825, (D)3300**
    - solution of equation for, **(A)1824**
  - for fault clearance on h.v. cables, **559**
  - gas-filled, use for number storage and sending, **2322**
  - German, post-war, **2081**
  - getter materials, German, **(B)1105**
  - grounded-grid, noise factor of, **2087**
  - growing-wave, two-beam, **1540**
  - h.f., electron-velocity-dependent characteristics of, **2974**
  - high-power, air cooling *vs* water cooling for, **(D)2950**
  - high-vacuum, surge testing of, **2661**
  - hum reduction in, **(D)1241**
  - industrial applications of, **2591**
  - interelectrode capacitance of, **2102, (D)2965**
    - effect of resistive films, **2385**
  - klystron, **2402**
    - elementary theory of, **1245**
    - low- and high-power, **262**
    - reflex, manufacture in Australia, **580**, miniature, for 2–12 kMc/s, **2679**, multifrequency bunching in, **(C)263, (D)1244**, Sperry SRL-17, **2403**, tunable cavity resonators for, **2476**
  - magnetron, cavity, **(D)3309**
    - c.w., space-charge effects and frequency characteristics of, **(A)1824**, wide-tuning-range, low-power, **(A)1824**
    - development review, **1554**
    - electron motion in, **1557**
    - frequency stability of dynatron-type oscillations, **259**
    - high-power, pulser and water load for, **579**
    - interdigital, high-power, **908**
    - microwave, **(B)588**
    - multi-segment, dynatron effect in, **2971**
    - relative efficiency of different sizes, **578**
    - resonator system design, **1555**
    - rising-sun, **909, 1558**, resonant modes of, **910**
    - single-cavity, turbator, **1556**
    - spiral-beam method for a.m. of, **2401**
    - split-anode, resonance oscillations in, **2972**, secondary emission in, **2973**
    - theory of, **261**
    - whole-anode, space charge in, **260**
  - manufacture, technique of, **2095, (A)2947**
    - use of optical polish, **1539**
  - microphony in, **(A)1824**
  - microwave, secondary-electron suppression in, **558**
  - miniature, American-type, made in France, **2079**
    - French, **2372, 2948**
    - Rimlock, **2080**, E-series, characteristics of, **565**
  - mixer, beam-deflection, for u.h.f., **2383**
  - modulator, German, for radar, **(B)2984**
  - output, secondary emission in, **2969**
  - oxide-cathode, effect of emission density on life of, **3593**
    - high-vacuum, poisoning in, **2092**
  - pentode, applications of screen-grid supply impedance, **258**
    - input-impedance variations of, **2395**
    - noise factor for λ 7.25 m, **1240**
    - RC-coupled, operating conditions of, **2394**
    - reduction of hum, **916**
    - with two control grids, **2968**
    - Types 5811 and 5807, **(A)1612**
  - pliotron, FP-54, use as stable voltage amplifiers, **55**
  - power, u.h.f., double-tetrode, **906**
  - power-output increase, **2393**
  - production-cost reduction in S.F.R. factory, **2952**
  - quality control of, **2374**
  - radial-beam, with e.s. focusing, **907**
  - reactance, performance for f.m. at u.h.f., **2389**
  - receiving, British and American, data for, **(B)2409**
    - European, **1234**
    - quality control of, **1117**
    - R.C.A. manual RC15, **(B)2962**
  - rectifying, **248**
    - gas-filled, hot-cathode, **1547**
  - with resistive loads, output voltage of, **2084**
  - resnatron, **1552**
    - and high-power transmission, **(A)1824**
  - retarding-field, equivalent circuit of, **1311**
  - rugged, **(A)1824**
  - shot effect, **255**
    - transit-time deterioration of space-charge reduction of, **2408**
  - similitude of, **902**
  - made by Standard Telephones and Cables, technical data, **(B) 2078**
  - thermionic, quadrature operation of, **1228**
  - thyratron, **(A)572**
    - and applications, **257**
    - hydrogen-filled hot-cathode, **2392**
    - measurement of ionization and deionization times, **2553 3186**
    - in radar modulators, **2391**
    - trends in construction of, **1239**
    - Type GL-5545, **(A)1834, 2966**
    - use for control of a.c. commutator motors, **473**
  - transconductance as criterion of performance, **2949**
  - transit-time, developments in Germany, 1939–1946, **2175**
  - transit-time effects, **3312**, **(D)3313**
    - and design of television receiver input circuits, **3113**
    - in output fields, **911**
  - transitrol, **1541**, for a.f.c., **(A)1235**
  - transmitting, **243**
    - air-cooled, **2095**, R.C.A. technical manual TT3, **(B)2963**
    - design of radiating fins, **2951**
    - development of, **3301**
    - forced-air cooling system for, **2377**
    - German, **(B)586**
    - glass, for 100-Mc/s range, **2665**
    - h.f., **2082**, design theory, **(A)903**
    - high-power, Th/W filaments in, **(A)1824**
    - for television, **(A)905**
    - water-jet cooling of, **2664**
  - travelling-wave, **2380**
    - as amplifiers for λ 6–8 cm, **3584**
    - circuits for, **2382**
    - development of, **561**
    - effect of radial field in, **2089, 2381**
    - effect of space charge in, **251**
    - efficiency of, **2953**
    - linear gain of ,**2954**
    - with magnetic field, **1544**
    - nonlinear phenomena in, **250**
    - periodic-waveguide amplifier, **(A)2667**
    - self-excited oscillations in, **3581**
    - slow-wave structures for, **2088**
    - theory of, **2379, 2666, 2669, 3596**
    - theory and construction of, **3580**
    - transverse fields in, **1543**
    - as wide-band oscillators, **1830**
  - trigger, secondary-emission, design of, **3070**
  - triode, current distribution in, **2388**
    - e.s. field in, **2961**
    - grounded-grid, 100-W, 1000-Mc/s, **569**
    - interelectrode capacitances, **2101, (D)2962**
    - microwave, Type BTL 1553, **2390, 2964**
    - negative-grid partition noise in, **571**
    - power, voltage/current relation for, **1833**
    - reduction of microphony in, **(D)2963**
    - semiconductor, transistor. See Transistor
    - u.h.f., **(D)338**, anode efficiency formula, **2100** pencil-type, **(A)1824**
  - trochotron, theory and applications of, **2083**
  - v.h.f., for frequencies over 1000 Mc/s, **2105**
    - as oscillators and amplifiers, **337**
    - with plane electrodes, **2373**
  - v.h.f. and u.h.f., test methods for, **3489**
  - v.m., **(B)1249**
    - design and operation of, **(B)3602**
    - efficiency of, **1558**
    - frequency stabilization of, **2104**
    - use as u.h.f. amplifiers, **(D)3106**
  - voltage-reference, Mullard 85A1, **560**
- **Velodyne**, **(D)2155**
- **Vibration** measurement, calibration of probes, **618**
  - testing, theory of, **3463**
- **Vibrators**, for pickup response measurement, **775**
- **Vocoder**, and R/T, **513**
- **Voltage** divider, controlled, **2453**
    - vacuum-capacitor, **3478**
  - division, for cm and mm waves, **2733**
  - measurement, a.c., use of Cu_2O rectifiers, **3187**
    - logarithmic-scale, **439**
    - with vector indicator, **2569, 2853**
  - regulation, generalized system, **859**
  - regulator. See Regulators.
  - standard, h.f., primary, **2262**. [illegible]
- **Voltages**, direct, small, measurement of, **3477**
- **Voltmeters**, for high d.c. voltages, **779**
  - high-impedance, for millivolt measurements above 5 Mc/s, **(A)1713**
  - h.v., absolute, **3475**
  - peak, calibration of, **781**
    - for pulses, **151**
  - peak-to-peak, **440**
  - rectifier, for dm and cm waves, **3474**
  - spark-gap, effect of short recurrent pulses, **783**
  - valve, bridge-type, **1435**
    - h.v., precision, **149**
    - reflex, **3476**
    - tuned, in carrier-current technique, **150**
- **Volume expansion**, surgeless, **(C)42**

W

- **Water**, electrical properties of, **3126**
  - supercooled, dielectric properties for λ 1.25 cm, **2505**
- **Wattmeters**, (See also Power meters)
  - microwave, low-power, sources of error in, **(D)2274**
  - using multiplying circuits, **3361**
  - water-flow, for cm λ, **447**
- **Wave propagation**, acoustic, in a tube, **926**
  - approximate solution of one-dimensional wave equations, **2602**
  - in piezoelectric crystals, **2201**
  - ultrasonic, in solid rods, **1567**
- **Wave propagation, e.m.**, (See also Field strength; Reception; Television)
  - accuracy of sky-wave delay measurements, **190**
  - approximate methods for diffraction problems, **817**
  - in atmospheric ducts, **1167, 1466, 1467, (D)2033, 2609**
    - at San Diego, **2610**
    - during thunderstorms, **1478**
  - coastal refraction, **1469**
  - over composite land and sea path, **2304, 2307, 3233**
  - in concentric cables, **13**
  - conditions in transitional microwave range, **(A)1757**
  - deviation at vertical incidence in ionosphere, **1763**
  - dissipation in absorptive medium, **1756**
  - distribution of field reflected by ionosphere, **1164**
  - fading, rapid, in m-λ broadcast reception in India, **2035**
    - relation of pulsations in atmospheric temperature, **2024**
    - of s.w. signals, and diversity reception, **823**
  - frequency variations due to F-layer height variations, **1163**
  - generalized magneto-ionic theory, **1464**
  - over ground of finite conductivity, **2892**
  - ground-wave, over inhomogeneous smooth earth, **1758**
    - signal variations, **2306**
  - gyro-interaction, **1477**
    - magneto-ionic theory of, **1476**
    - observations, **1767**
  - h.f. echoes, **3523**
  - Huyghens' principle, **1463**
    - formulae for, **1462**
    - unification of formulae for, **2022**
  - in inhomogeneous medium, theory of, **2023**
  - and intensity/distance law, **(D)482**
  - interference, diffraction and resolution in optics and radio, **191**
  - ionospheric, **(B)824, 3518**
    - theory of double refraction, **3232, 3519**
    - and solar activity, 1945–1947, **(A)2029**
    - tropospheric effects on, **2611**
  - mechanisms of, **1472**
  - and meteorology, **1159**
  - method of determining angle of arrival, **1481**
  - microwave, effect of ground constants, **822**
  - m.u.f. forecasting, **191, (D)487, (B)825**, from long-distance scatter, **1762**
  - m.u.f. measurements, at Freiburg, **2896**, for oblique incidence, **484**
  - in multi-layer medium of periodic structure, **1281**
  - multipath effects in transatlantic f.m. communication, **518, 1506**
  - N.D.R.C. report on, **3528**
  - over sea, for λ 3 cm and λ 9 cm, **2034**
  - phase measurement for λ 3.2 cm, over land, **493**, over sea ,**3241**
  - in presence of two electron beams, **1583**
  - range of low-power transmitters, **1161**
  - reflection, at inhomogeneous layer, **3231**
    - for oblique incidence, **(A)486**
  - in refracting atmosphere, **479**
  - research in Department of Scientific and Industrial Research 1937–1946, **189**
  - research, future developments, **1470**
  - scattering by metal wires and sheets, **3237**
  - Sommerfeld's radiation condition, **2603**
  - Sommerfeld theory and edge diffraction, **(A)480**
  - in spherically symmetrical inhomogeneous waveguides, **1158**
  - in stratified medium, **818, 2604, 2605, 2893**
  - studies of, **1473**
  - s.w., attenuation in ionosphere, **1165**
    - fading, **3236**, periodic, **1166**
    - influence of ionosphere on, **88**
    - optimum-frequency forecasting, **830**
    - over polar regions, **2608**
    - over 16000-km path, **3238**
  - and s.w. communication, **(D)483, (D)2894**
  - tensor field equations for region of variable refractive index, **2617**
  - tests, of 450 Mc/s transmissions to mobile receiver, **(A)1757**, at u.h.f., **(A) 1757**
  - theory of, **1471, (B)3242**
  - tropospheric effects at lower radio frequencies, **2308**
  - u.h.f., attenuation by rock, **(D)619**

characteristics of, 3249
superrefraction, 490, 492, coastal, in Australia, 2897, over land, 3239
u.s.w., 821
normal and abnormal refraction in troposphere, 2031
survey of Soviet work, 1160
vertical angle of arrival, 2299
variations at v.h.f. and u.h.f., (A)1757
very-long-wave phase difference between spaced aerials, 195
v.h.f., over sea, 2303
for television, (A)1757
for very long waves, (A)488
in waveguides, 296
through wire grid, 1754
2-path, distortion analysis for, (A)1757
Waveform, (B)2006
analysers, optimum performance of, 2265
analysis, of transient-response curves, (A)1718
effect on rectifier-type instrument accuracy, 765
pulse/sine-wave converter, 1606
Waveguides, with annular partitions, theory of, 2431
approximate calculations for, 293
branching filter for, 294
and cavity resonators, theory of, 416
channel-section radiator, 2426
circular, open-ended, symmetrical waves in, 1283
radiation scattering by resonant ring, 640
TM_{01} mode in, 16
transverse fields in, 3338
closed-ridge and open-ridge, 2425
coupled by apertures, equivalent circuits for, (A)1578
curved, TE_{01} waves in, 2430
cylindrical, and coaxial cables, propagation in, 297
diffraction and perturbation in, 1585
metal, excitation of e.m. waves in, 3039
slow waves in, 292, (D)641
dielectric, of circular section, propagation in, 1287
dielectric-filled, universal curves and permittivity measurement for, 1433
dielectric-loaded, for linear electron accelerators, 1744
disk-loaded, 2139
theory of, 1286
duo-mode exciter for, 3336
e.m. radiation from, 3041
excitation of, 946, 3036
field in, 291
higher-mode techniques for, (A)299
hybrid rings, 638
maximally flat filters in, 1320
metal, effect of slits in walls, 2429
modes in, 945
multiplex transmission through, 300
nearly circular, propagation in, 948
nonmetallic, fields in, 17
obstacle characteristics determined geometrically, 2140
open-ended, as radiators, 2432
π and H, critical frequencies of, 1285
rectangular, radiation from, (A)1578, 2433
reflections in, 2427, at capacitive diaphragm, 947, at corners, 2428, at dielectric, 3038, at sudden change of cross-section, 1858
with several dielectrics, 1288
theory of slots in, 639
reflection in, at dielectric, 1284
reflection cancellation in, 3037
slotted-line sections, new type, (A)2716
slotted sections, design for u.h.f., 2567
for slow waves, 1584, (D)3337
standard dimensions for, U.S., 2861
theory of, 3335
theory of propagation in, 296
transmission in, 3035
Wavemeter, for Citizens' Radio, 3482
resonant-cavity, for spectrum of pulsed transmitters, 1130
Waves, boundary-layer, optical, evidence for, 3116
e.m., (B)1562
cm-λ, optics of, 1647, radiation pressure of, 1759
diffraction from ionosphere and fading, 193
diffraction from meteor trails, 2508
fundamentals of, (B)1838
interaction in ionosphere, 194, (A)486
paths and absorption in reflecting layer, 1050
plane, in ionized gas, 2785, polarization representation, (A)1639
reflection and transmission by spherical shell, 2503
in region between mm λ and long-wave infra-red, 1026
slow, in cylindrical waveguides, (D)641
standing, 2723
type H_0, propagation theory, 2141
v.h.f., reflection from meteoric ionization, (D)489
0.1-mm, generation of, 2175
integral and series representations of, 2774
pressure, plane, steep-fronted, theory of, 2684
spherical, reflection of, 3117
Welding, r.f., of plastics, 3451
Wire, copper, iron-free, for moving-coil galvanometers, 1998
enamelled, microscopic examination of, 114
Wobbulator, self-checking, 2005
for television receiver testing, 155
Wind, measurement by radio d.f. methods, 1070

X

X-ray applications, thickness gauge, 2579, 2580
X-rays, diffraction camera, 1752
from 20-MeV betatron, spectrum of, 180

ERRATA

In "Abstracts and References" throughout the year.

Abstract	No.	219	For R. R. Wakeman read R. P. Wakeman.
,,	,,	220	Insert as authors M. Silver & H. French.
,,	,,	379	For R. G. Gebhardt read R. E. Gebhardt.
,,	,,	572	In last line, for " ow " read " low."
,,	,,	698	In title, for " pertubations " read " perturbations."
,,	,,	989	For Kleinwachter read Kleinwächter.
,,	,,	1190	In last sentence, for " letter " read " latter."
,,	,,	1253	For R. G. Bolt read R. H. Bolt.
,,	,,	1349	Title should read " The Absorption of Water Vapour in the Far Infra-Red ". Journal reference should be *Rep. Progr. Phys.*
,,	,,	1422	For correct title, see abstract No. 1976.
,,	,,	1727	Cancel the last sentence.
,,	,,	1964	For M. H. de Longchamp read M. Huot de Longchamp.
,,	,,	2165	For J. H. Mulligan read J. H. Mulligan, Jr.
,,	,,	2922	Add 4s. 6d. at end.
,,	,,	3152	For J. N. Sturtevant read J. M. Sturtevant.
,,	,,	3434	For M. Portier read Portier.

U.D.C. Changes

Calculating Machines 681.142
Glass-to-Metal Sealing 666.1.037.5
Pickups 681.85
Waveguides 621.392.26†

LIST OF JOURNALS

A selection of the journals which are regularly scanned is given below, together with the addresses of publishers or editorial offices and the abbreviations of titles as used in the Abstracts and References. Applications for copies of any journal should be made to the addresses given.

The full title of each journal is given first and is followed by the address, the abbreviated title being shown within parentheses. In a few cases the nature of a journal is indicated, where neither the title nor the address shows it clearly.

A

Acta Polytechnica, Royal Swedish Academy of Engineering Sciences, Stockholm, Sweden. (*Acta polyt., Stockholm*)

Alta Frequenza, Associazione Elettrotecnica Italiana, Torino 116, Corso Massimo d'Azeglio 42, Italy. (*Alta Frequenza*)

American Journal of Science, 501, Sterling Tower, New Haven, Conn., U.S.A. (*Amer. J. Sci.*)

Analytical Chemistry, American Chemical Society, 1155, Sixteenth St., N.W., Washington, D.C., U.S.A. (*Anal. Chem.*)

Annalen der Physik, Johann Ambrosius Barth, Leipzig C 1, Salomonstrasse 18B, Germany. (*Ann. Phys., Lpz.*)

Annales de Physique, Masson & Cie, 120, Boulevard Saint-Germain, Paris 6e, France. (*Ann. Phys., Paris*)

Annales de Radioélectricité, 23, rue du Maroc, Paris 19e, France. (*Ann. Radioélect.*)

Annali di Geofisica, Istituto nazionale di Geofisica, Città universitaria, Roma, Italy. (*Ann. Geofis.*)

Applied Scientific Research, Martinus Nijhoff, The Hague, Holland. (*Appl. sci. Res.*)

Archiv der elektrischen Übertragung, Wiesbaden-Biebrich, Mühlweg 2, Germany. (*Arch. elekt. Übertragung*)

Archiv für Elektrotechnik, Springer Verlag, Berlin-Charlottenburg 2, Jebensstrasse 1, *or* Heidelberg, Neuenheimer Landstrasse 24, Germany. (*Arch. Elektrotech.*)

Archiv für technisches Messen, Leibniz Verlag, München, Lotzbeckstrasse 2b, Germany. (*Arch. tech. Messen*)

Arkiv för Matematik, Astronomi och Fysik, published for Royal Swedish Academy of Sciences by Almqvist & Wiksells Boktryckeri A.-B., Stockholm, Sweden. (*Ark. Mat. Astr. Fys.*)

A.S.T.M. Bulletin, 20th and Northampton Streets, Easton, Pa, U.S.A. (*A.S.T.M. Bull.*)

Astrophysical Journal, University of Chicago Press, 5750, Ellis Avenue, Chicago 37, Illinois, U.S.A. (*Astrophys. J.*)

Audio Engineering, Radio Magazines Inc., 28, Renne Avenue, Pittsfield, Mass., U.S.A. (*Audio Engng, N.Y.*)

Australian Journal of Instrument Technology, 414, Collins St., Melbourne, Australia. (*Aust. J. Instrum. Tech.*)

Australian Journal of Scientific Research (Series A), 314, Albert Street, East Melbourne, C.2, Australia. (*Aust. J. sci. Res., Ser. A*)

Avtomatika i Telemekhanika, Academy of Sciences, U.S.S.R. (*Avtomatika i Telemekhanika*)

A.W.A. Technical Review, Amalgamated Wireless (Australasia) Ltd, Sydney, Australia. (*A.W.A. tech. Rev.*)

B

B.B.C. Quarterly, The British Broadcasting Corporation, The Grammar School, Scarle Road, Wembley, Middlesex, England. (*B.B.C. Quart.*)

Beama Journal, The British Electrical and Allied Manufacturers' Association, 36, Kingsway, London, W.C.2, England. (*Beama J.*)

Bell Laboratories Record, 463, West Street, New York 14, N.Y., U.S.A. (*Bell Lab. Rec.*)

Bell System Technical Journal, American Telephone and Telegraph Company, 195, Broadway, New York, N.Y., U.S.A. (*Bell Syst. tech. J.*)

British Journal of Radiology, 32, Welbeck Street, London, W.1, England. (*Brit. J. Radiol.*)

Brown Boveri Review, Artillery Mansions, 75, Victoria Street, London, S.W.1, England. (*Brown Boveri Rev.*)

Bulletin de l'Académie des Sciences de l'U.R.S.S., (*a*) **série physique,** (*b*) **série géographique et géophysique,** (*c*) **classe sciences techniques,** Academy of Sciences, Moscow, U.S.S.R. (In Russian.) (*Bull. Acad. Sci. U.R.S.S.,* (*a*) *sér. phys.,* (*b*) *sér. géogr. géophys.,* (*c*) *tech. Sci.*)

Bulletin of the American Meteorological Society, Executive Secretary, K. C. Spengler, 5, Joy Street, Boston 8, Mass., U.S.A. (*Bull. Amer. met. Soc.*)

Bulletin de l'Association suisse des Électriciens, 301, Seefeldstrasse, Zürich 8, Switzerland. (*Bull. schweiz. elektrotech. Ver.*)

Bulletin de la Société française des Électriciens, 8–14, Avenue Pierre-Larousse, Malakoff (Seine), France. (*Bull. Soc. franç. Élect.*)

Bulletin technique de la Suisse romande, F. Rouge & Cie, Lausanne, Switzerland. (*Bull. tech. Suisse romande*)

C

CQ, Radio Magazines Inc., 342, Madison Avenue, New York 17, N.Y., U.S.A. (*CQ*)

Câbles et Transmission, Sotelec, 16, Rue de la Baume, Paris 8e, France. (*Câbles & Transmission, Paris*)

Canadian Journal of Research (Sections A, B, and F), National Research Council, Ottawa, Canada. (*Canad. J. Res.*)

Chalmers tekniska Högskolas Handlingar, (Transactions of Chalmers University of Technology), N. J. Gumperts Bokhandel, Göteborg, Sweden. (*Chalmers tekn. Högsk. Handl.*)

Communications, Bryan Davis Publishing Co. Inc., 52, Vanderbilt Avenue, New York 17, N.Y., U.S.A. (*Communications*)

Communications on Pure and Applied Mathematics, Interscience Publishers Inc., 215, Fourth Avenue, New York 3, N.Y., U.S.A., and 2a, Southampton Row, London, W.C.1, England. (*Commun. pure appl. Math.*)

Communication News, Philips Telecommunication Industries, Hilversum, Holland. (*Commun. News*)

Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences, Gauthier-Villars, Quai des Grands Augustins 55, Paris, France. (*C. R. Acad. Sci., Paris*)

Comptes Rendus (Doklady) de l'Académie des Sciences de l'U.R.S.S., Academy of Sciences, Moscow, U.S.S.R. (In Russian.) (*C. R. Acad. Sci. U.R.S.S.*)

D

Distribution of Electricity, 51/53, Hatton Garden, London, E.C.1, England. (*Distrib. Elect.*)

E

Electrical Communication, International Telephone and Telegraph Corporation, 67, Broad Street, New York 4, N.Y., U.S.A. (*Elect. Commun.*)

Electrical Engineering, Journal of the American Institute of Electrical Engineers, 20th and Northampton Streets, Easton, Pa, U.S.A. (*Elect. Engng, N.Y.*)

Electrical Manufacturing, 1250, Sixth Avenue, New York 20, N.Y., U.S.A. (*Elect. Mfg, N.Y.*)

Electrical Review, Dorset House, Stamford Street, London, S.E.1, England. (*Elect. Rev., Lond.*)

Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, England. (*Elect. Times*)

Electrician, Bouverie House, 154, Fleet Street, London, E.C.4, England. (*Electrician*)

Electronic Engineering, 28, Essex Street, Strand, London, W.C.2, England. (*Electronic Engng*)

Electronics, 99-129, North Broadway, Albany 1, N.Y., U.S.A. (*Electronics*)

Électronique, 21, rue des Jeûneurs, Paris 2e, France. (*Électronique*)

Elektron, Linz, Anastasius-Grün-Strasse 4, Austria. (*Elektron, Linz*)

Elektron in Wissenschaft und Technik, Hanns Reich Verlag, München 13, Ainmillerstrasse 25, Germany. (*Elektron Wiss. Tech.*)

Elektrotechnik, Berlin, N.W.7, Dorotheenstrasse 41, Germany. (*Elektrotechnik, Berlin*)

Elektrotechnik und Maschinenbau, Journal of the Elektrotechnischer Verein Österreichs. Springer Verlag, Wien 1, Mölkerbastei 5, Austria. (*Elektrotech. u. Maschinenb.*)

Elektrotechnika, Journal of the Magyar Elektrotechnikai Egyesület. Budapest 5, Honvéd-utca 22, Hungary. (*Elektrotechnika, Budapest*)

Elektrotechnische Zeitschrift, Georg Westermann Verlag, Braunschweig, Riddagshäuser Weg 66, Germany. (*Elektrotech. Z.*)

Endeavour, Imperial Chemical Industries, Nobel House, Buckingham Gate, London, S.W.1, England. (*Endeavour*)

Engineer, 28, Essex Street, Strand, London, W.C.2, England. (*Engineer, Lond.*)

Engineering, 35 & 36, Bedford Street, Strand, London, W.C.2, England. (*Engineering, Lond.*)

Ericsson Review, Stockholm 32, Sweden. (*Ericsson Rev.*)

Ericsson Technics, Telefonaktiebolaget L.M. Ericsson, Stockholm, Sweden. (*Ericsson Technics*)

F

Fernmeldetechnische Zeitschrift, Friedrich Vieweg und Sohn, Braunschweig, Burgplatz 1, Germany. (*Fernmeldetech. Z.*)

FM-TV, 264, Main Street, Great Barrington, Mass., U.S.A. (*FM-TV*)

Frequenz, Schiele & Schön, Berlin, S.O.36, Leuschnerdamm 13, Germany. (*Frequenz*)

Funk und Ton, Verlag für Radio-Foto-Kinotechnik G.m.b.H., Berlin-Borsigwalde, Eichborndamm 141–167. (*Funk u. Ton*)

G

G.E.C. Journal, General Electric Co. Ltd, Magnet House, Kingsway, London, W.C.2, England. (*G.E.C. J.*)

General Electric Review, General Electric Company, 1, River Road, Schenectady 5, N.Y., U.S.A. (*Gen. elect. Rev.*)

General Radio Experimenter, General Radio Company, 275, Massachusetts Avenue, Cambridge 39, Mass., U.S.A. (*Gen. Radio Exp.*)

Génie Civil, 6, rue Jules-Lefebvre, Paris 9e, France. (*Génie civ.*)

Glass Industry, Ogden Publishing Company, 55, West 42nd Street, New York 18, N.Y., U.S.A. (*Glass Ind.*)

H

Helvetica Physica Acta, Journal of the Société Suisse de Physique. Éditions Birkhäuser S.A., Basel, Switzerland. (*Helv. phys. Acta*)

HF, 7, rue de la Science, Brussels, Belgium. (*HF, Brussels*)

I

Indian Journal of Physics, (and Proceedings of the Indian Association for the Cultivation of Science), 210, Bowbazer Street, Calcutta, India. (*Indian J. Phys.*)

Industrial and Engineering Chemistry, American Chemical Society, 1155, 16th Street N.W., Washington 6, D.C., U.S.A. (*Industr. Engng Chem.*)

Instruments, 921, Ridge Avenue, Pittsburgh 12, Pa, U.S.A. (*Instruments*)

J

Journal of the Acoustical Society of America, Prince and Lemon Streets, Lancaster, Pa, U.S.A. (*J. acoust. Soc. Amer.*)

Journal of the American Ceramic Society, 20th and Northampton Street, Easton, Pa, U.S.A. (*J. Amer. ceram. Soc.*)

Journal of Applied Physics, Prince and Lemon Streets, Lancaster, Pa, U.S.A. (*J. appl. Phys.*)

Journal of the British Institution of Radio Engineers, 9, Bedford Square, London, W.C.1, England. (*J. Brit. Instn Radio Engrs*)

Journal of the Franklin Institute, Prince and Lemon Streets, Lancaster, Pa, U.S.A. (*J. Franklin Inst.*)

Journal of Geophysical Research, (formerly **Terrestrial Magnetism and Atmospheric Electricity**), The Johns Hopkins Press, Baltimore 18, Md, U.S.A. (*J. geophys. Res.*)

Journal of the Institute of Navigation, c/o Royal Geographical Society, 1, Kensington Gore, London, S.W.7, England. (*J. Inst. Nav.*)

Journal of the Institution of Engineers, Australia, Science House, Gloucester and Essex Streets, Sydney, Australia. (*J. Instn Engrs, Aust.*)

Journal of Mathematics and Physics, Massachusetts Institute of Technology, Cambridge 39, Mass., U.S.A. (*J. Math. Phys.*)

Journal of the Optical Society of America, Prince and Lemon Streets, Lancaster, Pa, U.S.A. (*J. opt. Soc. Amer.*)

Journal de Physique et le Radium, 12, place Henri-Bergson, Paris 8e, France. (*J. Phys. Radium*)

Journal of Research of the National Bureau of Standards, U.S. Government Printing Office, Washington 25, D.C., U.S.A. (*Bur. Stand. J. Res.*)

Journal of the Royal Aeronautical Society, 4, Hamilton Place, Piccadilly, London, W.1, England. (*J. R. aero. Soc.*)

Journal of the Royal Society of Arts, York House, Portugal Street, London, W.C.2, England. (*J. R. Soc. Arts*)

Journal and Proceedings of the Royal Society of New South Wales, Science House, Gloucester and Essex Streets, Sydney, Australia. (*J. roy. Soc. N.S.W.*)

Journal of Scientific Instruments, The Institute of Physics, 47, Belgrave Square, London, S.W.1. England. (*J. sci. Instrum.*)

Journal of the Society of Glass Technology, Secretary, J. H. Partridge, D.Sc., Ph.D., Elmfield, Northumberland Road, Sheffield 10. England. (*J. Soc. Glass. Tech.*)

Journal of the Society of Motion Picture Engineers, 20th and Northampton Streets, Easton, Pa, U.S.A. (*J. Soc. Mot. Pict. Engrs*)

Journal of the Television Society, G. Parr (Ed.), 68, Compton Road, London, N.21, England. (*J. Televis. Soc.*)

L

Light Metals, Bowling Green Lane, London, E.C.1, England. (*Light Metals*)

M

Machinery, Clifton House, 83–117, Euston Road, London, N.W.1, England. (*Machinery, Lond.*)

Machinery, The Industrial Press, 148, Lafayette Street, New York 13, N.Y., U.S.A. (*Machinery, N.Y.*)

Marconi Review, Electra House, Victoria Embankment, London, W.C.2, England. (*Marconi Rev.*)

Materials and Methods, Reinhold Publishing Corporation, 330, West 42nd Street, New York 18, N.Y., U.S.A. (*Materials & Methods*)

Metal Industry, The Louis Cassier Co. Ltd, Dorset House, Stamford Street, London, S.E.1, England. (*Metal Ind., Lond.*)

Metal Progress, American Society for Metals, 7301, Euclid Avenue, Cleveland 3, Ohio, U.S.A. (*Metal Progress*)

Metal Treatment, 49, Wellington Street, Strand, London, W.C.2, England. (*Metal Treatm.*)

Metallurgia, The Kennedy Press Ltd, 21, Bedford Street, London, W.C.2, England. (*Metallurgia, Manchr*)

Metals Technology, 212, York Street, York, Pa, U.S.A. (*Metals Technol.*)

Microtecnic, Lausanne, Switzerland. (*Microtecnic, Lausanne*)

Modern Plastics, 122, East 42nd Street, New York 17, N.Y., U.S.A. (*Mod. Plast.*)

Monthly Notices of the Royal Astronomical Society, Burlington House, London, W.1, England. (*Mon. Not. R. astr. Soc.*)

Muirhead Technique, Muirhead & Co. Ltd, Beckenham, Kent, England. (*Muirhead Technique*)

N

Nature, Macmillan & Co. Ltd, St. Martin's Street, London, W.C.2, England. (*Nature, Lond.*)

Naturwissenschaften, Springer Verlag, Berlin–Charlottenburg 2, Jebensstrasse 1, Germany. (*Naturwissenschaften*)

New Zealand Journal of Science and Technology, Government Printer, Wellington, New Zealand. (*N.Z. J. Sci. Tech.*)

Nucleonics, 212, East York Street, York, Pa, U.S.A. (*Nucleonics*)

O

Observatory, Royal Observatory, Greenwich, London, S.E.10, England (*Observatory*)

Onde électrique, 40, rue de Seine, Paris 6e, France. (*Onde élect.*)

Oscillographer, Allen B. DuMont Laboratories, 1000, Main Avenue, Clifton, New Jersey, U.S.A. (*Oscillographer*)

P

Philips Research Reports, N.V. Philips Gloeilampenfabrieken, Eindhoven, Holland. (*Philips Res. Rep.*)

Philips Technical Review, (as for **Philips Research Reports**). (*Philips tech. Rev.*)

Philosophical Magazine, Taylor & Francis Ltd, Red Lion Court, Fleet Street, London, E.C.4, England. (*Phil. Mag.*)

Philosophical Transactions of the Royal Society, The Cambridge University Press, Bentley House, London, N.W.1, England. (*Philos. Trans.*)

Physica, Journal of the Dutch Physical Society. Martinus Nijhoff, The Hague, Holland. (*Physica, 's Grav.*)

Physical Review, Prince and Lemon Streets, Lancaster, Pa, U.S.A. (*Phys. Rev.*)

Post Office Electrical Engineers' Journal, Engineer-in-Chief's Office, Alder House, Aldersgate Street, London, E.C.1, England. (*P.O. elect. Engrs' J.*)

Poste e Telecomunicazioni, Ministero P.T., Via del Seminario 76, Roma, Italy. (*Poste e Telecomunicazioni*)

Priroda, Academy of Sciences, Moscow, U.S.S.R. (*Priroda*

Proceedings of the Cambridge Philosophical Society, The Cambridge University Press, Bentley House, London, N.W.1, England. (*Proc. Camb. phil. Soc.*)

Proceedings of the Institution of Electrical Engineers. Parts I, II & III, Savoy Place, London, W.C.2. England. (*Proc. Instn elect. Engrs*)

Proceedings of the Institute of Radio Engineers, 1, East 79th Street, New York 21, N.Y., U.S.A. (*Proc. Inst. Radio Engrs, W. & E.*)

Proceedings of the Institution of Radio Engineers, Australia, Science House, Essex and Gloucester Streets, Sydney, N.S.W., Australia. (*Proc. Instn Radio Engrs, Aust.*)

Proceedings of the National Academy of Sciences, Mack Printing Company, Easton, Pa, U.S.A. (*Proc. nat. Acad. Sci., Wash.*)

Proceedings of the National Electronics Conference, Mr. Karl Kramer, Secretary (for 1949), c/o Jensen Manufacturing Company, 6601, South Laramie Avenue, Chicago 38, Illinois, U.S.A. (*Proc. nat. Electronics Conference, Chicago*)

Proceedings of the Physical Society, 1, Lowther Gardens, Prince Consort Road, London, S.W.7, England. (*Proc. phys. Soc.*)

Proceedings of the Radio Club of America, 11, West 42nd Street, New York, N.Y., U.S.A. (*Proc. Radio Cl. Amer.*)

Proceedings of the Royal Society (Series A and B), Cambridge University Press, Bentley House, London, N.W.1, England. (*Proc. roy. Soc.*)

Q

QST, The American Radio Relay League Inc., 38, La Salle Road, West Hartford 7, Conn., U.S.A. (*QST*)

Quarterly of Applied Mathematics, 8, North 6th Street, Richmond, Va, U.S.A. (*Quart. appl. Math.*)

Quarterly Journal of the Royal Meteorological Society, 49, Cromwell Road, London, S.W.7, England. (*Quart. J.R. met. Soc.*)

R

RCA Review, RCA Laboratories Division, 30, Rockefeller Plaza, New York 20, N.Y., U.S.A. (*RCA Rev.*)

R.S.G.B. Bulletin, New Ruskin House, Little Russell Street, London, W.C.1, England. (*R.S.G.B. Bull.*)

Radio-Electronics (formerly **Radio Craft**), Erie Avenue, F to G Streets, Philadelphia 32, Pa, U.S.A. (*Radio-Electronics*)

Radio and Electronics, 46, Mercer Street, Wellington, New Zealand. (*Radio & Electronics, Wellington, N.Z.*)

Radio française, 92, rue Bonaparte, Paris 6e, France. (*Radio franç.*)

Radio & Television News, Ziff Davis Publishing Co., 185, N. Wabash Avenue, Chicago 1, Illinois, U.S.A. (*Radio & Televis. News*)

Radio professionnelle belge, Avenue Molière 1, Brussels, Belgium. (*Radio prof. belge*)

Radio professionnelle, Paris, 81, rue de la Pompe, Paris 16e, France. (*Radio prof., Paris*)

Radio Technical Digest (Édition française), 122, boulevard Murat, Paris 16e, France. (*Radio tech. Dig., Édn franç.*)

Research, Butterworth's Scientific Publications Ltd, 4–6, Bell Yard, Temple Bar, London, W.C.2, England. (*Research, Lond.*)

Reviews of Modern Physics, Prince and Lemon Streets, Lancaster, Pa, U.S.A. (*Rev. mod. Phys.*)

Review of Scientific Instruments, Prince and Lemon Streets, Lancaster, Pa, U.S.A. (*Rev. sci. Instrum.*)

Revue générale de l'Électricité, 12, Place Henri-Bergson, Paris 8e, France. (*Rev. gén. Élect.*)

Revue scientifique, 4, rue Pomereu, Paris 16e, France. (*Rev. sci., Paris*)

Revue technique Compagnie française Thomson-Houston, 173, Boulevard Haussmann, Paris, France. (*Rev. tech. Comp. franç. Thomson-Houston*)

Ricerca scientifica, Roma, Piazzale delle Scienze 7, Italy. (*Ricerca sci.*)

S

S.A.E. Journal, Journal of the Society of Automotive Engineers. Business Press Inc., 10, McGovern Avenue, Lancaster, Pa, U.S.A. (*S.A.E. J.*)

Schweizer Archiv für angewandte Wissenschaft und Technik, Buchdruckerei Vogt-Schild A.G., Solothurn, Switzerland. (*Schweiz. Arch. angew. Wiss. Tech.*)

Scientific Monthly, 10, McGovern Avenue, Lancaster, Pa, U.S.A. (*Sci. Mon.*)

Short Wave Magazine, 49, Victoria Street, London, S.W.1, England. (*Short Wave Mag.*)

Sylvania Technologist, Sylvania, Technical Relations Dept, Lawrence Street, Flushing, N.Y., U.S.A. (*Sylvania Technologist*)

T

T.S.F. pour Tous, 40, rue de Seine, Paris 6e, France. (*T.S.F. pour Tous*)

Technical Bulletin of the National Bureau of Standards, U.S. Government Printing Office, Washington 25, D.C., U.S.A. (*Tech. Bull. nat. Bur. Stand.*)

Technique Moderne, 92, rue Bonaparte, Paris 6e, France. (*Tech. mod., Paris*)

Technische Mitteilungen, (Swiss Post Office publication), Direction générale PTT, Berne, Switzerland. (*Tech. Mitt. schweiz. Telegr.-TelephVerw.*)

Tele-Tech, Caldwell-Clements Inc., Orange, Conn. U.S.A. (*Tele-Tech*)

Telegraph and Telephone Age, 25, Beaver Street, New York 4, N.Y., U.S.A. (*Telegr. Teleph. Age*)

Télévision française, 21, rue des Jeûneurs, Paris 2e, France. (*Télévis. franç.*)

Tesla Technical Reports, KOVO Ltd, Hybernska 32, Praha II, Czechoslovakia. (*Tesla tech. Rep., Prague*)

Tijdschrift van het Nederlandsch Radiogenootschap, Oude Utrechtscheweg 8, Baarn, Holland. (*Tijdschr. ned. Radiogenoot.*)

Toute la Radio, Société des Editions Radio, 9, rue Jacob, Paris 6e, France. (*Toute la Radio*)

Transactions of the American Institute of Electrical Engineers, 33, West 39th Street, New York 18, N.Y., U.S.A. (*Trans. Amer. Inst. elect. Engrs*)

Transactions of the South African Institute of Electrical Engineers, corner Marshall and Holland Streets, Johannesburg, S. Africa. (*Trans. S. Afr. Inst. elect. Engrs*)

W

Weather, 49, Cromwell Road, London, S.W.7, England. (*Weather, Lond.*)

Wireless Engineer, Dorset House, Stamford Street, London, S.E.1, England. (*Wireless Engr*)

Wireless World, (as for **Wireless Engineer**). (*Wireless World*)

Z

Zeitschrift für angewandte Physik, Springer Verlag, Berlin-Charlottenburg 2, Jebensstrasse 1, Germany. (*Z. angew. Phys.*)

Zeitschrift für Meteorologie, Deutscher Zentralverlag G.m.b.H., Berlin O.17, Michaelkirchstrasse 17, Germany. (*Z. Met.*)

Zeitschrift für Physik, Springer Verlag, Berlin-Charlottenburg 2, Jebensstrasse 1, Germany. (*Z. Phys.*)

Zhurnal eksperimentalnoi y teoreticheskoi Fisiki, Academy of Sciences, Moscow, U.S.S.R. (*Zh. eksp. teor. Fis.*)

Zhurnal tekhnicheskoi Fisiki, Academy of Sciences, Moscow, U.S.S.R. (*Zh. tekh. Fis.*)

Section V—1950

Index to

Abstracts and References

This section contains an index, listed separately by author and by subject, for all Abstracts and References published in PROCEEDINGS OF THE IRE from February, 1950, through January, 1951.

AUTHOR INDEX

AUTHOR INDEX—A name followed by "and" is that of the first author of a jointly written paper, while the word "with" indicates that the name indexed is that of the second author.

A

Abbott, F. R., and C. J. Fisher, graphical analysis of radiation patterns of u.h.f. aerial, **2720**
Abbott, N. A., electrical telemetry, **183**
Abele, J., design of nonlinear sine-wave oscillators, **323**
Abraham, L. G., L1 coaxial telephone and television system, **739**
Abramson, M., and S. Danko, miniaturization techniques, **(A)1355**
Acker, M., and B. Goldberg, comparison of modulation methods for radio facsimile, **(A)1511**
Ackermann, P., with others, Swiss radiosonde, **949**
Adam, M., transistor and transistron, **3210**
Adams, G. D., D. W. Kerst and C. S. Robinson, performance of 300-MeV betatron, **(A)2594**
—— with others, 80-MeV model of 300-MeV betatron, **2593**
Adams, N. I., Jr, with L. Page, diode space charge, **781**
Adams, R. T., R. A. Felsenheld and G. W. Sellers, high-selectivity mobile receiver, **(A)1501**
Adelsberger, U., with A. Scheibe, performance of P.T.R. quartz clocks and length of the astronomical day, **2275**
Adler, F. P., complex conductivity of ionized gas for microwaves, **875**
Adler, R., gated beam valve, **1292, 2931;** guided waves on inhomogeneous cylindrical structures, **(A)1338**
Affolter, H., 100–200-kW transmitter at Beromünster, **1524**
Aigrain, P., Ge diodes, backward current in, **1305,** and capacitance of, **1306;** surface conductance of germanium, **1818;** theory of communication, **1241**
—— and C. Dugas, characteristics of transistors, **1310**
Aigrain, P. R., B. R. Teare, Jr, and E. M. Williams, theory of band-pass/low-pass analogy, **61**
Aitchison, R. E., luminescence of (Ba, Sr)O, **653**
Albanese, L., and P. Schiaffino, coaxial-cable telephony systems, **1244**
Albers-Schoenberg, E., with others, ferrites, **659**
Albert, A. L., Fundamental Electronics and Vacuum Tubes, **(B)1037**
Albright, R. B., Philco built-in television aerial, **37**
Aldrich, D. F., with others, magnetic-amplifier studies on analogue computer, **2731;** speed of electronic switching circuits, **1353**
Alexander, B. H., with M. H. Dawson, metallography of Ge point-contact rectifiers, **(A)2542**
Alexander, J. W., simple localizer, **2512**
Alexander, L., E. Kummer and H. P. Klug, dead-time and nonlinearity of G-M-counter X-ray spectrometer, **181**
Alexander, P., powerful ultrasonic waves, **1322**
Alfvén, H., Cosmical Electrodynamics, **(B) 2777**
Alger, P. L., with J. J. Smith, justification of Heaviside methods, **(A)1182**
Alixant, M., European and American valves and c.r. tubes for television equipment, **1781;** magnetic amplifiers, **47;** magnetic recording, **22;** mass production of radio and television receivers, **214;** new radio components in world market, **1124**
Allen, J. S., applications of electron-multiplier tubes, **1815**
Allen, K. W., with others, 200-kV accelerator with gas-recovery system, (A)[illegible]
Allen, P. J., automatic standing-wave indicator, **2567**
Allison, H. W., and G. E. Moore, use of radioactive Sr in thermionic experiments, **(A)1906**
—— with G. E. Moore, thermionic emission of thin oxide films, **1165**
Allison, R. F., 95-mile television reception, **3193**
Almqvist, E., and others, 200-kV accelerator with gas-recovery system, **(A)2589**
Alpert, D., high-power microwave attenuator, **864**
—— with R. T. Bayard, extension of the low-pressure range of the ionization gauge, **2785**
Al'pert, Ya. L., F_2-layer observations during solar eclipse, May 1947, **1147, 1914**
Alt, F. L., Bell relay computer, **387**
Alvey, D., dynamometer wattmeter for a.f., **1726**
Amey, W. G., with others, stabilization of wide-band d.c. amplifier, **(A)598**
Amico, S. F., glass-sealed Ge diodes, **(A)1554**
Ammerman, C. R., direct measurement of bandwidth, **1608**
Amos, S. W., and F. W. Kellaway, Radio Receivers and Transmitters, **(B)2336**
An Wang. See Wang, An
Anan'ev, P. V., loudspeakers for remote collective farms, **16**
Ancel, E., properties and applications of thermistors, **49**
Anderson, F. B., wide-range oscillator, **(A)1355**
Anderson, G. M., and E. M. Williams, transient response to asymmetrical carrier systems, **(A)1511**
Anderson, L. J., and L. M. Wigington, bantam microphone, Type KB-2C, **805, 1850,** Type KB-3A, **1567**
Anderson, V. C., sound scattering from fluid sphere, **2686**
Andrejewski, W., with J. Meixner, diffraction of e.m. waves by circular disk or aperture, **2767**
Andrews, C. L., microwave diffraction pattern of circular aperture, **3141**
Andrews, D. H., with others, r.f. detection with CbN superconductor, **223**
Andrews, E. G., and H. W. Bode, use of relay digital computer, **1184**
Andrews, P., spectrometer for 10-cm λ with mechanical sweep, **2839**
Andrieux, P., with others, quartz and its use in telecommunications, **1706**
Andronow, A. A., and C. E. Chaikin, Theory of Oscillations, **(B)1648**
Angel, Y., Les Récepteurs de Radiodiffusion, **(B)738**
Angelakos, D. J., current and charge distributions on aerials and open-wire lines, **(A)1338**
Angello, S. J., Schottky rectifier theory and measurements on Cu_2O cells, **(A)240**
Angot, A., Compléments de Mathématiques à l'Usage des Ingénieurs de l'Électrotechnique et des Télécommunications, **(B)388**
Apker, L., external photoelectric effects in semiconductors, **(A)668;** surface phenomena useful in vacuum technique, **898**
Applebaum, A., and P. C. Fritsch, small-surface microwave diffraction [illegible]
Appleton, E. V., Heaviside and his layer, **2392**
—— and W. R. Piggott, ionospheric storms, **891**
Aram, J. H., with others, extraction of electron beam from 30-MeV synchrotron, **2857**
Arbelet, G., with others, millivoltmeter for the range 1 kc/s–30 Mc/s, **2285**
Argence, E., and K. Rawer, absorption in parabolic ionospheric layer, for oblique incidence, **1154,** for vertical incidence, **627**
Arguimbau, L. B., f.m. interference, **(A)1501**
—— and J. Granlund, sky-wave f.m. receiver, **734**
Armstrong, E. B., and K. G. Emeleus, h.f. oscillations in hot-cathode discharge tubes, **495**
Arni, P., rooms with adjustable reverberation time, **2407**
Arntzen, C. E., and R. D. Rowley, silicone rubbers, **127**
Arons, A. B., and D. R. Yennie, phase distortion of acoustic pulses reflected obliquely at interface of two media, **1840**
Arpiarian, N., with J. Saddy, luminescence-extinction effect of Ni and Co on ZnS, **2324**
Arthur, G. R., and S. E. Church, resistors at h.f., **2435**
—— and others, behaviour of resistors at h.f., **(A)1355**
Artman, R. G., with G. E. Hamilton, analysis of s.s.b. and d.s.b. transmission for television, **2911;** television transmitter lower-sideband measurements, **3086**
Arzelièr, H., boundary conditions for two absorbent media in contact, **436**
Aschen, R., aperiodic wide-band amplifier, **331;** television receiver with interchangeable units, **253**
—— and R. Gaillard, applications of a.f. analyser, **2230**
Ashbrook, F. M., with E. R. Toporeck, rockets range instrumentation, **(A)1467**
Ashcroft, H., and C. Hurst, transit-time correction factor for cylindrical noise diodes, **499**
Asher, H., self-adjusting timebase, **1112**
Ashour, A. A., induction of electric currents in a circular disk, **2488**
Ashwell, G. E., with B. G. Pressey, fixed H-Adcock v.h.f. direction finder, **1418**
Ashworth, J. A., core-loss test for Si steel strip, **683**
Aske, V. H., 400-Mc/s receiver front-end design, **216**
—— and J. Grund, improved method of frequency conversion, **(A)1501**
Aslakson, C. I., velocity of e.m. waves, **206, 2610**
Aspin, J. J. E., v.h.f. multiplex R/T equipment, **1004**
Assadourian, F., f.m. distortion in linear systems with slightly irregular transfer characteristics, **(A)1338**
Åström, B., decade pulse counter for G-M tubes, **2144**
Atherton, A. H., with C. S. Bull, MgO/$BaCO_3$ secondary-emission cathode, **1556**
Atkinson, P. D., with H. M. Gale, magnetic amplifiers, **(D)45**
Atlee, Z. J., thoriated tungsten filaments in rectifiers, **(A)243**
Atti, E., hum in a.c.-heated transmitting valves, **2936**
Attree, V. H., electronic stimulator for biological research, **1206;** slow-sweep timebase, **589**
Attwood, S. S., Electric and Magnetic Fields, **(B)1399**
Augenblick, H. A., with W. Sichak, tunable microwave waveguide filters, **(A)1355**
Aumont, R., temperature control with thyratron, **2032**
Auwärter, M., and A. Kussmann, ferromagnetic Pt/Mn alloys, **2789**
Averbukh, R. E., and M. S. Kosman, dielectric properties of $BaTiO_3$, **2800**
Avins, J., design of absorption traps, **841**
Axelbank, M., rotary McLeod gauge, **2784**
Axon, P. E., overall frequency characteristic in magnetic recording, **2121**
Aynberg, A. A., ionization distribution in ionosphere and recombination coefficient of F layer, **889**
Azéma, C., magnetron oscillation modes, **508**
—— with J. Legres, measurements on magnetrons, **507**

B

Babani, B. R., International Radio Tube Encyclopedia, **(B)1038**
Babcock, H. W., stellar magnetic fields, **2771**
Babcock, W. E., use of miniature pentode RCA-6CB6 in television i.f. amplifiers, **(A)1534**
Babits, V. A., and F. Hicks, Jr, electro-optical filters for colour television, **(A)1534**
Bacon, R. C., and J. R. Pollard, dekatron counter tube, **2066**
Baer, R. H., voice-switched intercommunication system, **2890**
v. Baeyer, H. J., multiplex R/T relay equipment using p.m. microwaves, **3165**
Bähring, H., and others, television developments by Fernseh G.m.b.H., 1939–1945, **2909**
Bailey, A., mobile radio, **2631**
Bailey, N. A., measurement of low-energy β-rays, **(A)955**
Bailey, V. A., circularly polarized waves in the sun's atmosphere, **1909;** electro-magneto-ionic optics, **2490**
—— and K. Landecker, electro-magneto-ionic waves, **2768**
—— and J. A. Roberts, graphical study of dispersion of electro-magneto-ionic waves, **1665**
Bailin, L. L., with others, radiation characteristics of shielded turnstile aerial, **(A)1866**
Bakanowski, A. E., and R. B. Lindsay, crystal pickup for ultrasonic measurements on rods, **1061**
Baker, G. W., springy construction of rugged receiving valves, **(A)1554**
Baker, W. R., with W. K. H. Panofsky, focusing of proton beam of Berkeley cyclotron, **2600**
Balakrishnan, C., and J. D. Craggs, velocity of discharge propagation in Geiger counters, **1982**
Balde, J. W., J. C. Bregar and K. L. Chapman, calibrated c.r.o. curve tracer, **1460**
Banbury, P. C., and H. K. Henisch, frequency response of PbS transistors, [illegible]
—— with others, crystal diode and triode action in PbS, **2088**
Banerjee, S. S., and R. N. Singh, morning fading of s.w. signals and thermal F_2-layer expansion, **440**
Banks, D. L., electronic amplifiers, **(A)1998**
Baños, A., with others, radiation characteristics of shielded turnstile aerial, **(A)1866**
Banthorpe, C. H., hard-valve frame timebase, **2455**
Barbezat, A., with C. Guillaud, magnetic properties of Mn ferrite, **2239**
Barbier, J. C., effect of annealing on residual magnetization of ferromagnetics, **2233;** magnetic after-effect in the Rayleigh domain, [illegible]
Bardeen, J., a.c. impedance of contact rectifier, **349;** infrared absorption in Si and Ge, **(A)2469**
—— and W. Shockley, deformation potentials and mobilities in non-polar crystals, **3032;** scattering of electrons in crystals, **3031**
Barden, S. E., effect of rain on marine-radar echoes, **2511**
Barducci, I., comparison of artificial ears of G.P.O. and I.N.U.A., **1565**
Bareham, W. C., facilities at WBAL-TV, Baltimore, **256**
Barker, J. R., magnetic field inside solenoid, **1700**
Barkhausen, H., Les Tubes Électroniques et leurs Applications, **(B)1039**
Barkow, P., f.m. s.w. carrier systems, **1001;** signal/noise ratio in dm-wave relay chain, **3167**
—— with E. Dietrich, dm waves in German telephone service, **2624**
Barney, K. H., binary quantizer, **672**
Baron, P., objective measurement of noise, **1059**
Barré, M., with R. Bureau, large-scale variation of level of atmospherics, **97**
—— with others, propagation of WWV and WWVH standard-frequency transmissions, **1232**
Barritt, R. C., mobile f.m. broadcast reception, **2881**
Barrow, W. L., pulse navigation systems, **648**
Barrucand, P., Fourier and Mellin transforms of inverse Bessel functions, **2553;** Laplace transformation and summation formulae, **2555**
Bartels, J., and J. Veldkamp, international data on magnetic disturbances, 2nd quarter 1949, **1140,** fourth quarter 1949, **2498**
Basard, R., with others, phase distortion in feeders, **2125**
Bassetti, L., Dizionario Tecnico della Radio, **(B)1317**
Bateman, R., E. F. Florman and A. Tait, source of error in radio phase-measurement systems, **2515**
Bates, D. R., upper atmosphere, **94**
—— and M. J. Seaton, theory of formation of ionosphere layers, **1407**
Battison, J. H., experimental u.h.f. television, **2036;** VOR signal generator, **2292**
Baude, A., cloud height measurement by means of light pulses, **427**
Baxandall, P. J., output impedance control, **(D)1337**
Bayard, M., synthesis of passive networks, **62**
Bayard, R. T., and D. Alpert, extension of the low-pressure range of the ionization gauge, **2785**
Bayha, J., casting-resin technique, **2541**
Bayliff, R. W., with H. V. Griffiths, electronic diversity switching, **304**
Bayly, J. G., analogue computer, **1951**
Bazhenov, K. V., with F. E. Il'gekit, suppression of radio interference from h.f. induction-heating oscillators, **1506**
Beale, F. S., with others, voice-operated switching for carrier systems, **1243**
Beam, R. E., and D. G. Harman, dielectric-tube aerials, **(A)1338**
—— and H. D. Ross, Jr, impedance and radiation characteristics of slotted-cylinder aerials, **2710**
Beard, E. G., a.v.c. system for positive-modulation television, **1789;** negative feedback in radio receivers, **449;** reflex receiver with feedback, **783;** signal-frequency and oscillator circuits for a.m./f.m. receivers, **447**
Beard, G. B., and others, design of racetrack synchrotron, **(A)2597**
Beatty, R. W., determination of attenuation from impedance measurements, **3094**
Bechmann, R., with others, piezoelectric crystals for filters, **116**
Beck, A. H., transit-time effects in u.h.f. valves, **(D)1299**
Beck, F. J., Jr, with M. G. Schorr, e.m. field of conical horn, **2979**
Beck, G. E., 'suppressed' aircraft aerials, **286**
Becker, J. A., photoeffects in semiconductors, **(A)668;** transistors, **1026**
Becker, M., with others, nucleon-bombarded silicon, **(A)1938**
Becker, S., dark-room exposure meter, **176**
Becker, W., wave propagation in the ionosphere, **439**
—— and W. Dieminger, frequency of occurrence and structure of the ionosphere E_2 layer, **1915**
Beckman, O., with P. Ohlin, 800-kV Van de Graaff generator and accelerator, Uppsala, **2000**
Beckmann, B., wave-propagation measurements in Germany, **441**
Beggs, G. E., Jr, range-adjusting radiosonde recorder, **(A)703**
Beghian, L., with others, high-pressure counters and their uses, **3125**
Begovich, N. A., extension of Llewellyn's planar-diode transit-time solution, **497;** slot radiators, **2711**
Béguin, C., and G. Maugard, location of line faults by pulse methods, **3091**
Behrent, L. F., with M. C. Selby, bolometer bridge for r.f. voltage measurement, **1974**
Beindorf, W., development of bearing-test methods, **1327**
Belevitch, V., network theorem, **(D)833;** nonlinear distortion in Cowan modulator, **(D)2167;** nonlinear effects in rectifier modulators, **1633;** synthesis of general passive quadripoles, **(D)574;** theory of bifilar transmission line, **2126**
Belgodère, P., with A. Fromageot, design of stagger-tuned amplifiers, **856**
Beljers, H. G., and D. Polder, *g*-factors of ferrites, **1930**
Bell, D. A., gain of aerial systems, **(D)820, (C)1086;** valve noise and electron transit time, **(D)1308**
Bell, P. R., and H. A. Straus, electronic pile simulator, **3082**
Bell, R. L., induced grid noise, **1833,** and noise factor, **1507**
Bender, D., with A. Schulze, carbon-layer resistors, **302**
Benfield, A. E., electrical tachometer, **184;** magnetism and the rotation of celestial bodies, **(D)2204**
Benham, W. E., transit-angle functions and Fourier transforms, **(D)1832**
Benner, A. H., diurnal variation of vertical-incidence ionospheric absorption at 150 kc/s, **2503**
—— C. H. Grace and J. M. Kelso, polarization of 150-kc/s waves reflected from the ionosphere, **3137**
Bennett, A. E., and K. A. Gough, influence of operating conditions on design of capacitors, **2735**
Bennett, J., high-speed digital calculating machines, **2263**
Bennett, J. B., with L. S. Lappin, 1-kW u.h.f. television transmitter Type TTU-1A, **2659**
Bennett, W. R., linear varying parameter and nonlinear circuit analysis, **1606**
—— with C. B. Feldman, bandwidth and transmission efficiency, **454**
Bennington, T. W., ionosphere review for 1949, **1145;** Short-Wave Radio and the Ionosphere, **(B)2218;** sunspot and ionospheric storm, 20th February 1950, **1500**
Benoit, J., graphs of tanh x/x for dielectric impedance at u.h.f., **935**
Benson, F. A., and A. O. Carter, phase measurement with c.r.o., **1965**
—— W. E. Cain and B. D. Clucas, characteristics of glow-discharge voltage-regulator valves, **1014**
Benson, J. E., H. J. Oyston and B. R. Johnson, television synchronizing-signal generator, **760**
Benz, F., h.f. filter with band-pass properties, **3000**
Benzer, S., high-inverse-voltage Ge rectifiers, **241**
Beranek, L. L., Acoustic Measurements, **(B)1857;** developments in acoustic design of studios, **1847**
—— W. H. Radford and J. B. Wiesner, sound-system design for reverberant auditoria, **(A)1319**
Bergmann, L., Der Ultraschall und seine Anwendung in Wissenschaft und Technik, **(B)2703**
Bergtold, F., directional characteristic curves and surfaces for aerials, **2961**
Berkeley, E. C., Giant Brains, or Machines that Think, **(B)2273**
Berkley, C., and H. P. Mansberg, technique for high-speed c.r.o. oscillography, **759**
Berlage, H. P., magnetic moment and structure of rotating celestial bodies, **1139**
Bernard, W. B., admittance meter, **2834**
Bernhart, J., Traité de Prise de Son, **(B)1579**
Bernstorff, H., sintering of iron powders, **130**
Bersis, D. S., SrS-Zn phosphors, **2521**
Bertaut, F., with others, magnetic properties of Cu ferrite, **2786;** thermal variation of coercive field of powdered cobalt, **2235**
Bertaux, G., with others, propagation of WWV and WWVH standard frequency transmissions, **1232**
Berterottière, R., magnetic focusing of a cylindrical electron beam with density modulation, **786**
—— with others, amplification by direct electronic interaction, **511**
Berth-Jones, E. W., measurement of turntable speed fluctuations, **272**
Berthelot, A., equipment for use with G-M counters, **696**
Bertrand, R., with C. Guillaud, resistance of ferrites, **2240**
Berz, F., potentials derived from axial values in electron optics, **2002**
Besson, P., Oboe system, **647**
Besson, R., a.f. amplifiers, **2123**
Best, A. C., size distribution of raindrops, **2215**
Best, N. R., matrix telemetry system, **2850**
Beste, H. E., and G. D. Hulst, noise-elimination circuit, **(A)1534**
de Bettencourt, J. T., and H. Klemperer, beacon technique for identifying propagation paths, **2873**
Beurtheret, C., high-power h.f. oscillators for industrial use, **1381**
Bevan, P. A. T., grounded-grid power amplifiers, **593**
Beyer, R. T., and Ming-Yi Wei, theory of magnetic amplifiers, **2730**
—— with J. A. Krumhansl, Barkhausen noise and magnetic amplifiers, **298**
Beynon, W. J. G., application of ionospheric data to s.w. transmission, **(A)1485;** tropospheric effects in medium- and short wave propagation, **213**
Bezladnov, N. L., efficiency of valves in public-address amplifiers, **75**
Bhattacharyya, A. N., instrument landing system for aircraft, **2782,** microwave, **2783;** microwave modulation by variable waveguides or cavity resonators, **3195**
Bidlingmaier, M., modulation meter, **3096**
Bierman, A., and H. A. Oele, betatrons with and without iron yoke, **1209**
Biermasz, A. L., and H. Hoekstra, strain gauges Types GM4472 and GM4473, **418**
Biguenet, C., photoadsorption of a thin layer of Ba, **3030;** pulsed operation of oxide cathodes, **2867**
Billig, E., and P. T. Landsberg, characteristics of barrier-layer rectifiers, **1528**
Birks, J. B., properties of ferromagnetics at cm λ, **1178**
Birnbaum, G., and J. Franeau, measurement of dielectric constant and loss angle of solids and liquids, **397**
Birnbaum, M., with D. C. de Packh, capture process in betatron-injection synchrotron, **2599**
Bishop, G. R., with others, high-pressure counters and their uses, **3125**
Bishop, P. O., and E. J. Harris, d.c. amplifier for biological application, **2174**
Bishop, W. B., with C. F. Hobbs, techniques for close channel spacing at v.h.f., **(A)1511**
Bitcheno, W. R., aircraft h.f. and m.f. communication transmitters, **1282**
Bivans, E. W., and J. V. Harrington, electronic storage system, **(A)1441**
Blachman, N. M., demodulation of f.m. carrier and random noise by discriminator, **448**
—— and E. D. Courant, dynamics of synchrotron with straight sections, **187**
Black, W. L., and H. H. Scott, a.f. measurements, **139,** for broadcasting systems, **147, 148**
Blake, L. V., reflection of radio waves from rough seas, **1756**
Blanc-Lapierre, A., and M. Kubner, travelling-wave amplifiers, [illegible]
—— and M. Perrot, thin Ag films, detector properties of, **2536,** resistance of, **2242**
Blankenburg, W., d.c. choke and magnetic amplifier, **43**
Blass, J., and others, equivalent circuits for slots in rectangular waveguides, **(A)1338**
Bleazey, J. C., with others, loudspeakers for 'personal' radio receivers, **(A)1319, 1760**
Blewett, J. P., r.f. problems of particle accelerators, **(A)1467**
—— with others, 3-kMeV proton accelerator, **1738**
Bloch, A., pulse communication, **(D)1517**
Blok, J., and C. C. Jonker, asymmetrical multivibrator circuit, **3006**
Blondé, R., with G. Chardon, S.A.C.M. impedance bridge No. 2135, **948**
Bloom, J. N., with D. C. Rose, saturated-core recording magnetometer, **2276**

Blunt, R. F., with W. F. Love, dielectric properties of BaTiO$_3$ at low temperatures, **1702**
Boadle, R. D., aerial polar diagrams by means of models, **558**
Bochirol, L., with others, magnetic properties of Cu ferrite, **2786**
Bode, H. W., and C. E. Shannon, smoothing and prediction theory for stationary time series, **1713**
—— with E. G. Andrews, use of relay digital computer, **1184**
Bodez, P., rotating aerial for automatic radiogoniometer, **1159**
Bodle, R. R., Cheltenham indices *K*, July–Sept. 1949, **1141**, Jan.–March 1950, **2499**
Boegli, C. P., a.f. equalizer design chart, **1620**
Boelens, W. W., measurement of f.m. hum in r.f. signal, **3102**
de Boer, K., stereophony, **13**
Böer, W., electrical measurements using valve amplifiers, **2826**
Boerner, T. J., 150-kW 540–1600-kc/s broadcasting transmitter, **2656**
Boers, C. J., detector circuits for f.m. receivers, **2880**
Boff, A. F., equipment for noise and distortion tests on v.h.f. links, **2575**; test set for measurements on coaxial cables, **2572**
Bogert, B., with others, separation of variables in Laplace's equation, **2260**
Bogert, B. P., viscous losses in large acoustic waveguides, **2887**
Bogle, R. W., valve noise at very low frequencies, **(A)2084**
Bohm, D., and E. P. Gross, plasma oscillations, effects of plasma boundaries in, **3027**, theory of, **88**, **89**
Bohnenblust, M., with others, Swiss radiosonde, **949**
Boisard, J., with J. Pujolle, measurement of reverberation times of Radiodiffusion Française studios, **2962**
Boissinot, G., with J. Ortusi, slotted waveguides and their use as aerials, **2129**
Boisvert, M., with P. Bricout, f.m. methods for displacement measurement, **174**
Bolle, A., S. Silleni and C. A. Tiberio, F$_2$-layer critical-frequency recordings, Rome, Sept. 1948–March 1949, **1684**
Bollman, J. H., and J. G. Kreer, application of thermistors in control networks, **1350**
Bolt, R. H., acoustics of rooms, **(A)533**
—— and A. D. MacDonald, theory of speech masking by reverberation, **532**
—— P. E. Doak and P. J. Westervelt, pulse statistics analysis of room acoustics, [illegible]
Bolton, J. G., and G. J. Stanley, galactic r.f. source Taurus-A, **887**
Bolz, G., operating properties of ultrasonic quartz crystal, **2115**
Bomford, K. D., physical principles of valve operation, **483**; receiving valves for use below 30 Mc/s, **1291**
—— and A. H. F. Hunt, survey of modern h.f. transmitting valves, **2058**
Bond, W. L., double-crystal X-ray goniometer, **3053**
Bonfiglioli, G., and G. Montalenti, generalized-impedance method applied to e.m. screening, **3033**
Böning, P., new type of electrometer, **3097**
Bonvalot, P., with P. Patriarche, c.r. tubes for study of transients, **506**
Booker, H. G., magneto-ionic theory for waves incident obliquely on stratified ionosphere, **714**
—— and P. C. Clemmow, angular spectrum of plane waves: relation to polar diagram and aperture distribution, **1082**; Sommerfeld theory and theory of edge diffraction, **1226**
—— and W. E. Gordon, theory of radio scattering in troposphere, **1757**
Booth, C. F., with A. H. Mumford, television radio relay links, **2026**
—— with others, London/Castleton experimental radio relay system, **3169**
Boothroyd, A. R., E. C. Cherry and R. Makar, electrolyte tank for network response measurements, **(A)1360**
Boothroyd, W., dot systems of colour television, **1264**
Borden, P. A., and G. M. Thynell, Principles and Methods of Telemetering, **(B)1746**
Borg, L. F., transductors and their application, **1596**
Borgnis, F., measurement of resonance resistance of cavities, **321**; resonance frequency of cavity magnetrons, **3214**
Borkowski, C. J., proportional counters for measurement of soft radiation, **(A)955**
Borts, R. B., with others, measurement of aerial radiation patterns by means of metal lens, **2133**
Borzyak, P. G., with others, properties of Sb-Cs cathodes, **1800**
Bostwick, L. G., with A. C. Keller, vibrating-reed selectors for mobile radio systems, **756**
Botas, J. M. H., with R. de L. Ortueta, applications of square-wave generator, **2579**
Bouchard, J., L'Émission Électronique, **(B)793**
Bouchier, G., study of disk recorders and reproducers by dynamic analogy, **1856**
Boucke, H., and H. Lennartz, distortion-measurement apparatus, **2571**; sensitive d.c. amplifier, **1889**
Boudouris, G., radiation patterns and gain of square aerial array, **554**
Bouix, M., slotted waveguides as aerials, **814**; u.h.f. measurement apparatus, **2569**
Bourot, J., with others, visualization of vibratory phenomena in resonant tube, **2955**
Bousquet, A. G., G.R. signal generator 1001-A, **946**
Bouthillon, L., philosophy of teaching of electricity, **1042**
Boutry, G. A., with J. L. Delcroix, planar magnetron under static space-charge conditions, **1828**
Bouwkamp, C. J., acoustic field of freely vibrating circular disk, **1821**; effective length of linear transmitting aerial, **1584**; transmission coefficient of circular aperture, **(D)84**
Bowen, W. A., with others, geomagnetic field strength at great altitudes, **2497**
Bower, J. L., error coefficients of servomechanism, **2902**
—— and P. F. Ordung, synthesis of RC networks, **1605**
Boyajian, A., circular and hyperbolic functions in electrical engineering, **1439**
Boyd, M. R., with L. Malter, thyratron grid emission and trigger-grid thyratron, **(A)1554**
Boyd, R. L. F., positive-ion collection by probe in electrical discharge, **1901**
Boyer, R. F., random noise in dielectric materials, **2550**
Bozorth, R. M., factors affecting quality of ferromagnetic materials, **2234**
Braak, D. J., mobile radio equipment, Type SRR192, **3172**
Bracewell, R. N., measurements on long and very long waves, **(A)1495**
Bradburd, E., and L. Pollack, wide-band r.f. problems in television transmitters, **(A)1534**
—— with others, design considerations in television transmitters, **(A)1534**
Bradfield, G., international convention on ultrasonics, Rome, 1950, **2397**; obstacle detection by ultrasonic waves in air, **415**; Physical Society symposium on applications of ultrasonics, **1981**
Bradwell, J., with others, pulse-amplitude analyser, **1448**
Brailsford, F., magnetic materials for electrical power plant, **(A)113**
Brain, A. E., compensation for phase errors in wide-band video amplifiers, **2752**
Brans, P. H., Röhren Vade-Mecum 1950, **(B)2681**
Brasseur, M., with C. W. Winkler, 9-tower broadcasting array at WDGY, **2431**
Braude, G. V., K. V. Epaneshnikov and B. Ya. Klimushev, design of complex correcting circuits for television amplifiers, **1369**
Brauer, G., Lorenz 10-kW u.s.w. transmitter for f.m. broadcasting, **2922**
Brauer, P., rise in brightness of infrared-sensitive phosphors, **3057**
Braunbek, W., diffraction, at circular disk, **2182**, at plane screen, **2183**; energy flow in near field of a diffracting edge, **2473**
Breant, P., p.t.m. and p.w.m., **2344**
Breen, P., 5-kW visual and 2·5-kW aural television amplifiers, **(A)1534**
Bregar, J. C., with others, calibrated c.r.o. curve tracer, **1460**
van der Breggan, J. C., with others, millivoltmeter for the range 1 kc/s–30 Mc/s, **2285**
Brekhovskikh, L. M., multilayer medium, field of point source in, **1216**, **1394**; reflection of plane waves from, **1217**
Brekoo, H. P. J., with T. Douma, h.f. filament heating for cascade h.v. generator, **1527**
Bremmer, H., ionospheric double refraction, **1752**; propagation of e.m. waves at oblique incidence and WKB approximation, **205**
Brendel, R., calculations for parabolic reflectors, **1343**
Brenner, M. M., data transmission over narrow-band communication circuits, **(A)1511**
Brentano, J. C. M., and D. H. Davis, electrical properties of semiconductors, **(A)2544**
Bressi, A., and G. G. Sacerdote, recording of nonlinear distortion, **2964**
Brettingham-Moore, E. A., multiplex broadcasting in Australia, **2023**
Brewer, G. R., with L. Malter, microwave *Q* measurements in presence of series losses, **400**
Bricout, P., and M. Boisvert, f.m. methods for displacement measurement, **174**
Bridgewater, T. H., R. H. Hammans and S. N. Watson, televising the 1950 Oxford and Cambridge boat race, **2906**
Briganti, E., u.h.f. measurement of dielectric constant and power factor, [illegible]
Briggs, B. H., G. J. Phillips and D. H. Shinn, analysis of radio fading observations at spaced receivers, **1233**
Briggs, G. A., Sound Reproduction, **(B)1071**
Briggs, P. H., industrial servomechanism, **(A)1998**
Briggs, T. H., figure of merit and performance of oxide cathodes, **(A)2082**
Briller, S. A., and N. Marchand, differential vectorcardiograph, **(A)1467**
Brillouin, J., transient radiation from sound sources, **1839**
Brillouin, L., scattering cross-section of spheres for e.m. waves, **870**; theory of travelling-wave valve for large amplitudes, **1296**; WKB approximation and Hill's equation, **2554**
Brinkley, J. R., multistation v.h.f. schemes, **2627**
Briot, A., waveguides beyond cut-off frequency, **813**, **(C)1582**, impedance of, **551**
Brissonneau, P., with R. Musson-Genon, directional coupler for impedance measurement at u.h.f., **1720**
Bříza, J., rotatable directive aerial, **2429**
Broc, J., bolometer measurement of cm-λ power, **1727**; cavity resonators formed by concentric spheres, **1104**, variation of frequency for small displacement of inner sphere, **1105**
Brochet, P., with L. Néel, molecular field of Ni/Zn ferrites, **1170**
Brockelsby, C. F., negative-feedback amplifiers, **(D)1123**
Brockman, F. G., magnetic ferrites for use at h.f., **660**
—— P. H. Dowling and W. G. Stenbeck, dielectric constant of a ferromagnetic ferrite, **1932**
Brodin, J., application of Huyghens' principle, to refraction, **1218**, for imperfectly transparent medium, **523**, **712**, **1749**; vectorial space of regular waves, **1748**
Brogle, A. P., Jr, design of reactive equalizers, **846**
Bröndum-Nielsen, B., electronic key, **1281**
Brookes-Smith, C. H. W., and J. A. Colls, recent improvements in electronic measurement techniques, **(A)1998**
Broser, I., scattering and absorption of luminescence light in polycrystalline phosphors, **2470**
Brown, C. B., transistors, h.f. operation of, **2459**, magnetically biased, **2089**
Brown, C. W., with F. L. Hill, universal visual valve tester, **411**
Brown, D. R., and P. L. Morton, University of California digital computer, **(A)1441**
Brown, E. C., Metropolitan Police R/T system, **2626**
Brown, G. H., interference from r.f. heating equipment, **2620**
Brown, H., with others, rise times of photomultiplier voltage pulses, **2864**
Brown, J., corrections to attenuation constants of piston attenuators, **280**; design of metallic delay dielectrics, **1088**; gain of aerial systems, [illegible]
Brown, J. N., round-the-world 18-kc/s signals, **1231**
—— and J. M. Watts, ionosphere observations at 50 kc/s, **2506**
Brown, P. C., Istanbul 150-kW broadcasting station, **1775**
Brown, S. C., and C. Maroni, plateau slopes in self-quenching G-M counters, **1984**
—— with A. D. MacDonald, electron diffusion in spherical cavity, **2191**
Brownless, S. F., with T. Somerville, listeners' sound-level preferences, **2118**
Bruck, G., J. Higgins and J. Ward, automatic exposure control for aerial photography and television, **1999**
Brück, L., travelling-wave valve, **3204**
Brueckmann, H., anti-fading broadcasting aerial, **1863**, **(C)2716**
Bruijning, H. G., pulse transformers, **2988**
Brundage, J., and J. Zyda, transmission-measuring set for l.f. carrier systems, **157**
Brustman, J. A., with J. J. Lamb, polycathode glow tube for counting, **266**
Brylinski, E., impedance of free waves, **877**, **(D)1397**
Bube, R. H., cathodoluminescence efficiency and decay of ZnF$_2$-Mn, **108**
Bucher, E. E., with F. J. Lundburg, aerial for v.h.f. radio ranges and d.f., **(A)1338**
Buckley, E. F., with L. C. Manley, neon-diode ring counter, **832**
—— with others, high-capacity matrix-commutated radio telemetry system, **(A)1467**
Budeanu, C., resistance of e.m. waves, **607**
Budlong, W. A., and B. C. Lutz, automatically synchronized electronic switch, **1603**
Buechner, W. W., with E. N. Strait, photocell input impedance for voltage stabilizer, **1013**
Buehler, E., with A. C. Walker, production of large quartz crystals, **2795**
Buell, E. L., with others, photoformer in anacom calculations, **2814**
Bull, C. S., space charge in planar diodes, **2383**
—— and A. H. Atherton, MgO/BaCO$_3$ secondary-emission cathode, **1556**
Bullard, E. C., e.m. induction in rotating sphere, **606**
Bullington, K., signal-strength variations at v.h.f. and u.h.f., **1496**
Buneman, O., oscillations in dense electron beams under crossed fields, **1667**; toroidal magnetron, **2097**
Bunimovich, V. I., fluctuations as oscillations of random amplitude and phase, **1834**
Bunting, E. N., G. R. Shelton and A. S. Creamer, properties of Ca-Ba titanate dielectrics, **1709**
Bura, P., and D. M. Tombs, resonant circuit with periodically variable resistor, **3001**
Bürck, W., prevention of feedback between loudspeaker and microphone, **2968**; valve amplifiers for dm waves, **329**
Bureau, R., sudden increases of atmospherics on long waves, **1499**
—— and M. Barré, large-scale variation of level of atmospherics, **97**
Burgmann, V. D., distance-measuring equipment for aircraft navigation, **102**
Burkhardt, G., dispersive power and natural oscillation of an ionized gas, **2482**
Burmaster, K. E., with E. C. Evans, Philips-type ionization gauge for pressure range 10^{-3}–10^{-7} mm Hg, **2518**
Burns, L. L., Jr, with W. van B. Roberts, mechanical r.f. filters, **59**
Burr, D. W., with J. Neale, Thames R/T Service, **999**
Burr, R. P., measurement of modulation of television signals, **172**
Burroughes, E. R., planning of v.h.f. mobile systems, **1248**, **2629**
Burton, J. A., H. E. Kern and R. T. Lynch, thermionic properties of dense oxide cathodes, **(A)2073**
Bush, H. D., departure from Rayleigh's law of magnetization, **3029**
Bushby, T. R. W., servicing of airborne equipment, **693**
Busignies, H., distance-measuring equipment for aerial navigation, **645**; errors in radio navigation systems, **(A)1416**
—— and M. Dishal, relations between speed of indication, bandwidth and signal/noise ratio in navigation and d.f., **364**
Busser, J., with others, fast multiplying circuit, **(A)2558**
Bussey, H. E., estimation of microwave attenuation from rainfall and water-vapour statistics, **2879**
Butler, F., p.w.m. circuits, **854**
Byalik, G. I., signal distortion in television receiver, **1545**
Byam, L. A., Jr, with J. Z. Millar, microwave propagation, **2616**, test, **(A)1482**

C

Cady, W. M., M. B. Karelitz and L. A. Turner, Radar Scanners and Radomes, **(B)651**
Cain, W. E., with others, characteristics of glow-discharge voltage-regulator valves, **1014**
Callendar, M. V., signal/thermal-noise ratios for f.m. and a.m. receivers, **1503**
Calvert, J. F., with others, photoformer in anacom calculations, **2814**
Camp, L., and F. D. Wertz, low-*Q* directional transducer, **(C)536**
Campbell, A. J., v.h.f. mobile communication systems, **751**
Campbell, R. D., diotron r.m.s. instruments, **2570**
Camras, M., magnetic record duplication process, **2808**
Canegallo, G., with E. Paolini, resistor noise, **1465**, **2295**
Carbenay, F., recorder for mean level of atmospherics, **2282**
Carleton, J. T., with others, magnetic-amplifier studies on analogue computer, **2731**
Carlin, H. J., and L. N. Torgow, microwave attenuators for powers up to 1000 W, **2843**
Carmichael, G. N., phase control for television aerial, **2655**
Carniol, B., amplifier-stability testing with square waves, **77**; transient phenomena in receivers, **218**
Caro, D. E., and J. K. Parry, stabilized 100-A power supply, **467**
Carpenter, E. E., Philips Type 3655 portable c.r.o., **1459**
Carr, L. H. A., Giorgi system of units, **2193**
Carr, R. J., with B. H. Denney, inductive prompting system, **227**
Carrara, N., torque and angular momentum of cm-λ e.m. waves, **354**
Carruthers, J. A., nonlinear amplifier, **2748**
—— with others, measurement of aerial radiation patterns by means of metal lens, **2133**
Carter, A. O., with F. A. Benson, phase measurement with c.r.o., **1965**
Cassee, E., rectifier equipment with stabilized battery-charging voltage, **2903**
Cassignol, C., ion source for intense beams, **2855**
Castellan, G. W., and F. Seitz, transition from insulation to conduction in Si, **(A)2545**
Castellini, N. R., magnetic amplifier, **1348**
—— D. L. Jacoby and B. Keigher, p.c.m. methods, **(A)1511**
"Cathode Ray", filters, **1100**, characteristic impedance of, **578**; LC smoothing circuits, **58**
Caussé, R., with others, harmonic distortion of sound receivers, **799**; watch, as noise source for audiometry, **1064**
Caywood, W. P., Jr, with C. S. McKown, synchro-cyclotron field regulator, **(A)1467**
Cazalas, A., large-screen projection of television pictures, **3187**
Cazenave, R., inductance of toroidal coils, **1874**
Cerillo, M. V., integral approximation method for study of transient effects, **(A)1355**
Chaikin, C. E., with A. A. Andronow, Theory of Oscillations, **(B)1648**
Chalk, J. H. H., optimum pulse shape for pulse communication, **1518**
Challice, C. E., electron optics of 3-stage electron microscope, **965**
Chalmers, J. A., Atmospheric Electricity, **(B)98**; measurement of atmospheric vertical electric field, **140**
Chamagne, É., and G. Guyot, negative-feedback amplifiers, **863**
Chambers, C. V., crystal-controlled oscillators, **1375**
Chambers, L. G., input impedance of crossed dipoles, **2427**
Chambers, R. G., conductivity of thin wires in axial magnetic field, **2762**
Champeix, R., oxide cathodes, electronic temperature of, **2068**, electronic and thermodynamic temperatures of, **1303**
—— with P. Gandin, cathode temperature measurement, **265**
Chance, B., J. Busser and F. C. Williams, fast multiplying circuit, **(A)2558**
Chandler, C. H., dielectric rod as waveguide, **1079**
Chang Chen, Tung. See Tung Chang Chen.
Chang, Han, and V. C. Rideout, reactance-valve oscillator, **326**
Chang, Sze-Hou, G. E. Pihl and M. W. Essigmann, speech sounds and their statistical properties, **(A)1319**
Chanson, P., electron-optics of e.s. lenses: resolving power of electron and proton microscopes, **(A)1476**
Chapman, C. L., Ag/Zn light-weight accumulator, **1255**
Chapman, K. L., with others, calibrated c.r.o. curve tracer, **1460**
Chapman, N. F., B.B.C. film-dubbing suite for television, **2910**
Chardon, G., and R. Blondé, S.A.C.M. impedance bridge No. 2135, **943**
Charp, S., harmonic analyser, **(A)674**
Chartier, C., J. Bourot and J. Noël, visualization of vibratory phenomena in resonant tube, **2955**
Chase, R. L., measurement of a varying frequency, **1462**
Chatterjee, S. K., and B. V. Sreekantan, electron transit time in negative-grid oscillators, **1820**, **3002**; u.h.f. absorption and reflection by sea water, **1904**
Chauvierre, M., television line standard and receiver economics, **766**
Chavasse, P., artificial ear of C.N.E.T., **1564**; artificial mouth, **1058**; symposium on noise, London, 1948, **1066**; symposium on architectural acoustics, Marseilles, April 1950, **2961**
—— and R. Lehmann, background noise and use of white noise in acoustics, **2399**; study of acoustics of telephone bells, **1825**; telephony and noise in aircraft, **1328**
—— and P. Poincelot, application of negative feedback to electroacoustic systems, **1068**
—— R. Caussé and R. Lehmann, harmonic distortion of sound receivers, **799**; watch, as noise source for audiometry, **1064**
Cherne, Kh. I., impedance measurement for circuits shunted by negative resistance, **934**
Cherry, D. D., and C. S. Shyman, radio Doppler investigation of meteor speeds, **1907**
—— with others, electrolyte tank for network response measurements, **(A)1360**
Chester, W., diffraction of sound pulse at open end of semi-infinite duct, **2683**; propagation of sound waves in open-ended channel, **1560**
Chikhachev, B. M., with S. E. Khaykin, solar r.f. radiation during eclipse, May 1947, **1135**, **1906**
Chinn, H. A., and P. Eisenberg, tonal-range preferences, **802**
Chisholm, J., with F. E. Lutkin, storm location by radar in S.E. Asia, **362**
Chisholm, J. P., E. F. Buckley and G. W. Farnell, high-capacity matrix-commutated radio telemetry system, **(A)1467**
Chocholle, R., auditory sensation produced by square waves, **2402**
Chodorow, M., and others, development of 10-cm high-power pulsed klystron, **(A)1554**
—— with V. Westberg, space-charge effects in reflex klystrons, **(A)1554**
Chrétien, L., colour television in U.S.A., **1535**; critical study of measurements on receivers, **3104**; stabilized supply unit using Mazda-2050 thyratrons, **1532**, design and performance of, **2356**
Christopher, H. N., with others, quality rating of television images, **(A)1534**
Church, S. E., with G. R. Arthur, resistors at h.f., **2435**
—— with others, behaviour of resistors at h.f., **(A)1355**
Churchill, R. V., Introduction to Complex Variables and Applications, **(B)2270**
Churchward, V. R., with others, insulation improvement for glass and ceramics by use of organosilicon compounds, **3066**
Cioffi, P. P., stabilized permanent magnets, **2549**
Ciscel, B., and R. Ruhland, closed-cycle 8-channel pen recorder, **2797**
Clark, C. B., and F. J. Kamphoefner, panoramic sweep circuits, **68**
Clark, C. W., with others, r.f. detection with CbN superconductor, **223**
Clark, G. L., gravitational and magnetic fields of rotating bodies, **2205**
Clark, G. W., and L. B. Snoddy, production of high-current pulses with resonant-cavity accelerator, **(A)2591**
Clark, J. S., with others, operation of M.I.T. 350-MeV synchrotron, **(A)2595**
Clark, J. W., effects of intense microwave radiation on living organisms, **(A)1467**
—— and R. E. Neuber, dynamic electron-trajectory tracer, **1960**
Clarke, E. T., criteria for selection of radioactive isotopes for industrial use, **(A)960**
Clavier, A. G., carrier-power requirements for microwave communications, **2346**; Fourier transforms and variable-frequency circuit analysis, **307**, **2441**; reciprocity between generalized mutual impedances, **1358**, **2444**; transmission efficiency and Hartley law, **1513**
—— P. F. Panter and W. Dite, signal/noise ratio in pulse-count-modulation system, **460**
Clay, J., determination of absolute capacitance of cylindrical capacitors, **141**
—— and H. F. Jongen, solar flare, 19th Nov. 1949, and cosmic rays, **3039**
—— and F. van der Maesen, dielectric constant of gases, **128**
Clayton, R. J., with D. C. Espley, London/Birmingham television radio relay link, **1006**
Clegg, J. A., and I. A. Davidson, radio echo method for height of reflecting point of meteor trail, **1692**
Cleland, J. W., K. Lark-Horovitz and J. C. Pigg, Ge semiconductors produced by neutron bombardment, **2195**
Clemens, G. J., tapered coaxial-line termination, **2421**
Clemmow, P. C., with H. G. Booker, angular spectrum of plane waves: relation to polar diagram and aperture distribution, **1082**; Sommerfeld theory and theory of edge diffraction, **1226**
de Clerck, F., measurement of time constant of peak voltmeters, **153**
Cluett, B. D., with others, characteristics of glow-discharge voltage-regulator valves, **1014**
Clyne, P., Progressive Mathematics, **(B)3085**
Cochrane, C. A., transmission through parallel-plate prisms, **1844**
Cockcroft, J., linear accelerators and synchrotrons, **428**
Cocking, W. T., c.r. tube deflector coil characteristics, **2043**; detuning methods of measuring inductance and *Q*, **143**
Coe, M. R., with others, G-M counter for civilian defence use, **2861**
Coenraets, A., television i.f. amplifiers, **3191**
Cohen, B. M., r.f. performance of receiving valves in television circuits, **262**
Cohen, S., analysis and design of self-saturable magnetic amplifiers, **(A)1355**
Cohn, S. B., design of wide-band waveguide filter, **2743**; electrolytic tank measurements for microwave delay lens media, **2833**; metal-strip delay structure for microwave lenses, **(C)290**
Colaguori, V. J., and R. Guenther, wide-band directive aerial for 50–170 Mc/s, **(A)1338**
Cole, W. P., and E. G. Hamer, multistation v.h.f. f.m. mobile communication systems, **2632**
Coleman, B. L., propagation of e.m. disturbances along a buried wire, **1858**
Coles, R. V., automatic control of moisture content, **182**
Colin, J. E., classification of ladder-filter half-sections, **575**
Collard, J., G. R. Nicoll and A. W. Lines, discrepancies in measurements of microwave power, **1191**
Colli, L., U. Facchini and E. Gatti, pulses in argon counters, **3126**
Collie, C. H., with others, high-pressure counters and their uses, **3125**

Collinge, B., dead-times of self-quenching counters, **948**
Colls, J. A., with C. H. W. Brookes-Smith, recent improvements in electronic measurement techniques, **(A)1998**
Colombani, A., action of periodic magnetic field on metal film, **1671**; effective permeability and *Q* of magnetic powders, **1172**, at h.f., **2787**; filter theory and Tchebycheff polynomials, **569**; h.f. resistance of stranded-wire coil, **602**; self inductance of spherical shell and mutual inductance with endless solenoid, **2766**
Colombo, S., Laplace transformation and transient phenomena, **914**; principle of similitude and application to measurements on aerials, **1126**
Comes, H. N., impedance of broad-band aerials, **285**
—— H. V. Cottony and J. M. Watts, 600-Ω multiwire Δ aerial for ionosphere recorders, **2975**
Conley, P., open-wire lines: image-line measurements, **810**
Conrad, F., monitoring quartz clocks by means of time signals, **928**
Conrad, M., differential-amplifier null detector, **1189**
Convert, G., magnetic focusing of cylindrical electron beams, **485, 785**
Conway, M., with M. A. Ellison, solar flare 10th Nov. 1949, **1911**
Conway, W. R., deposited-film resistors, **301**
Cook, A. F., mathematical characteristics of sunspot variations, **1137**
Cook, E., small-town mobile f.m. equipment, **1525**
Cooke, S. P., and F. K. Willenbrock, interaction of spiral electron beam and resonant cavity, **1626**
Cooke-Yarborough, E. H., and others, pulse-amplitude analyser, **1448**
Cooper, V. J., 'cathode repeater' amplifier, **2168**
Cooter, I. L., pulse packing in magnetic recording wire, **2265**
—— with others, absolute measurement of resistance, **932**
Copeland, P. L., and D. N. Eggenberger, electron transit time between coaxial cylinders, **1286**
Copson, E. T., diffraction by plane screen, **2471**
Corbett, J. P., electrical analogues of linear systems, **(A)834**
Corby, R. E., acoustic c.r. anemometer, **950**; theory of 3-terminal capacitor, **2438**
Corcoran, G. F., Basic Electrical Engineering, **(B)2952**
Corey, B. V., with J. H. Green, Jr, analogue solution of differential equations by networks, **(A)1955**
Cornebise, M., with others, quartz and its use in telecommunications, **1706**
Cornelius, P., definitions and units of e.m. quantities, **1653**; vector diagram for h.f. transmission lines, **33**
—— and H. C. Hamaker, rationalized Giorgi system, **867**
Cornford, E. C., with F. E. Jones, velocity of cm waves as function of path height, **206**
Corrington, M. S., transient response of filters, **60, 2741**
Corruccini, R. J., effect of heat treatment on resistance of Pt, **(A)2540**
Cosslett, V. E., new simplified electron microscopes, **3119**
Cottony, H. V., with others, 600-Ω multiwire Δ aerial for ionosphere recorders, **2975**
Courant, E. D., with N. M. Blachman, dynamics of synchrotron with straight sections, **197**
Courier, P. L., abacs for output-transformer design, **826**
Coursey, P. R., fixed resistors for communication equipment, **(D)300**; hermetic sealing of capacitors, **1180**
Court, W. P. N., phase-shift oscillator, **(D)1378**
Couybes, S., with M. Denis, measurement of *Q* and natural frequency of cavity resonators, **931**
Coxall, N., Type EA40 diode in television line timebases, **782**
Craggs, J. D., with C. Balakrishnan, velocity of discharge propagation in Geiger counters, **1982**
—— with S. C. Curran, Counting Tubes, **(B)2319**
Crain, C. M., microwave recording of atmospheric refractive-index fluctuations, **2565**
Crawford, J. H., Jr, and K. Lark-Horovitz, fast-neutron-bombardment effects in Ge, **2196**; thermal equilibrium in neutron-irradiated Ge, **3024**
—— and F. E. Williams, properties of ZnF$_2$ and ZnF$_2$-Mn, **2792**
Creamer, A. S., with others, properties of Ca-Ba titanate dielectrics, **1709**
Crede, J. H., and J. P. Martin, magnetic properties of oriented 50% Ni/Fe alloy, **872**
Crespi, S., with A. Nizery, Saint-Cyr laboratory for study of resistance of materials under tropical conditions, **676**
Creveaux, H., with C. Guillaud, ferromagnetic properties of mixed ferrites, **1699**; preparation and magnetic properties of ferrites of Mn and Co, **1698**
Crichton, J., *K*-index of geomagnetic activity at Eskdalemuir, 1940–1947, **622**
Croft, R. T., mechanical development of radio altimeter, **1837**
Crompton, J. W., impedance/frequency characteristics of slot aerials, **1087**
Croning, L. J., thoria and other refractory materials, **(A)1933**
Crosby, M. G., H. J. Meyer and A. H. Ross, comparison of modulation methods for R/T, **(A)1511**
Crossley, W., with others, effect of Ni-core impurities on emission of oxide cathodes, **(A)2074**
Crouzard, M., with B. Decaux, Doppler effect in propagation of decametre waves, **1227**
Crow, J. H., and V. C. Rideout, photocell Type CE-70V, **1288, 2928**
Crowhurst, N. H., transformer-winding capacitance, **296**
Crowley, D. J., with D. H. Menzel, point sources of radio noise, **1405**
Crowley, T. H., and V. H. Rumsey, relation between geometry and impedance characteristics of radiating systems, **(A)1338**
Crowther, J. A., Ions, Electrons and Ionizing Radiations, **(B)3036**
Crump, E. E., with H. R. Foster, methods and apparatus for visual analysis of audio waveforms, **2690**
Cuccia, C. L., resonance frequencies and characteristics of coupled circuits, **1625**
—— and J. S. Donal, Jr, electron coupler: spiral-beam u.h.f. modulator, **1822**
Cudney, L. F., with others, field stabilization for large electromagnet, **1531**
Cuénod, M., automatic regulation, **3175**
Cullen, A. L., absolute measurement of microwave power, **1978**; measurement of microwave transmission efficiency, **684**; waveguide field patterns for evanescent modes, **1076**
Cullwick, E. G., The Fundamentals of Electromagnetism, **(B)355**
Cummings, M. E., with E. E. Moyer, control requirements for d.c. adjustable-voltage drives, **704**
Cunningham, D. H., with others, duo-cone loudspeaker, **17, 1069**
Curie, D., mechanism of phosphorescence in crystals, **2181**
Curran, S. C., and J. D. Craggs, Counting Tubes, **(B)2319**
Currie, B. W., with others, origin of 10-cm radiation from polar aurora, **2776**; radar reflections from auroras, **1688**
Cushing, V. J., with E. Mittelmann, electronic flowmeter and applications, **(A)1467**
Cutolo, M., gyro-interaction effects and their interpretation, **2617**; gyro-interaction of radio waves in ionosphere, **2328**

D

Dailey, H. J., surge testing of transmitting valves, **169**
Dallenbach, W., phase focusing in linear and in spiral accelerators, **1208**
Dammers, B. G., and others, Applications of the Electronic Valve in Receiving Sets and Amplifiers, **(B)991**
Dana, H. J., and J. L. Van Meter, pin-pointing ultrasonic energy, **1561, 2685**
Danforth, W. E., and F. H. Morgan, electrical conductivity of sintered thoria, **(A)1934**; electrical resistance of thoria, **2539**
Danielson, G. C., with R. K. Willardson, effect of light on diamond counter, **1202**
Danko, S., with M. Abramson, miniaturization techniques, **(A)1356**
Darlington, S., realization of constant phase, **1359**
Darwin, C. G., Weber's function, **385**
David, E. E., Jr, r.f. phase control in microwave oscillators, **(A)1355**
Davidson, I. A., and J. A. Clegg, radio echo method for height of reflecting point of meteor trail, **1692**
Davies, G. L., C. B. Pear, Jr, and P. E. P. White, u.h.f. test oscillator using buzzer, **2581**
Davis, C. H., telescopic mountings in electronic equipment, **1015**
Davis, D. H., with J. C. M. Brentano, electrical properties of semiconductors, **(A)2544**
Davis, H. B., use of reactance chart for filter design, **577**
Davis, H. M., mathematical machines, **916**
Davis, K. H., with others, c.r. sound spectroscope, **9**
Davis, R. E., with others, nucleon-bombarded silicon, **(A)1938**
Dawley, R. L., Radio Handbook, **(B)2953**
Dawson, M. H., and B. H. Alexander, metallography of Ge point-contact rectifiers, **(A)2542**
Day, G., electronic pressure-sensitive transducer, **192**
Day, G. A., r.f. measurements, **1187**
Day, G. E., with S. N. Mead, synchronous units for telemetry and telecontrol, **2353**
Day, J. P., and L. G. Trolese, s.w. propagation over desert terrain, **1492**
Day, J. R., power valves in parallel at u.h.f., **474**
Dayton, B. B., measurement of pumping speeds, **898**
Dazey, M. H., and others, synchrotron r.f. system, **2598**
De Bell, J. M., Jr, with W. H. Sayer, Jr, television aerial diplexers, **(A)1355**, [illegible]
Decaux, B., and M. Crouzard, Doppler effect in propagation of decametre waves, **1227**
—— M. Barré and G. Bertaux, propagation of WWV and WWVH standard-frequency transmissions, **1232**
Deise, I. F., and L. W. Gregory, 3-kW m.f. transmitter design, **1284**
Deketh, J., Fundamentals of Radio Valve Technique, **(B)519**
De Lange, O. E., variable-phase-shift f.m. oscillator, **325**
DeLano, R. H., signal/noise ratio of linear detectors, **221**
Delattre, M., and K. Kühnert, transient regime in series transductor, **564**
—— with K. Kühnert, no-load characteristic of transductor, **299**
Delbord, Y., television, in relief and in colour, **2638**, standards, **1538**
Delcroix, J. L., and G. A. Boutry, planar magnetron under static space-charge conditions, **1828**
Dell, H. A., measurement of transient phenomena, **(A)1998**
Dellinger, J. H., Radio Technical Commission for Aeronautics, **1920**
Deloraine, E. M., pulse modulation, **459**
Denis, M., noise measurement for cm-wave amplifiers, **930**; wide-band matching of amplifier and cm-wave oscillator, **2148**
—— and S. Couybes, measurement of *Q* and natural frequency of cavity resonators, **931**
—— and P. Palluel, phase measurement for cm-wave circuits, **682, 1721**
Denisse, J. F., emission of radiation of thermal origin in ionized media, **2192**
Denney, B. H., and R. J. Carr, inductive prompting system, **227**
Dennis, F. R., and E. P. Felch, reactance-valve modulation of phase-shift oscillators, **1022**
D'Entremont, F. R., with others, butyl moulding insulation for small transformers, **2802**
Depp, W. A., and W. H. T. Holden, circuits for cold-cathode glow tubes, **489**
Devèze, H., magnetostriction in Fe/Ni alloys, **1697**
Devonshire, A. F., theory of BaTiO$_3$, **663**
Dewan, J. T., voltage stabilizer for 200 kV, **3176**
—— with others, 200-kV accelerator with gas-recovery system, **(A)2589**
"**Diallist**", interference from fluorescent tubes, **1509**
Dickinson, T. M., with T. W. Dietze, betatron circuits, **429**
Diemer, G., and J. L. H. Jonker, low-distortion power valves, **484**; secondary-emission valve, **2381**
—— and K. S. Knol, frequency conversion by phase variation, **1759**; total-emission conductance measurements at λ 15 and 35 cm, **517, 2086**
—— with K. S. Knol, rubber model for studying e.m. waves in rectangular waveguides, **1861**; spontaneous fluctuations in double-cathode valves, **791**
Dieminger, W., ionosphere sounding in Germany, **892**
—— with W. Becker, frequency of occurrence and structure of the ionosphere E$_s$ layer, **1915**
Dietrich, E., and P. Barkow, dm waves in German telephone service, **2624**
Dietze, T. W., and T. M. Dickinson, betatron circuits, **429**
DiGiovanni, H. J., with others, G-M counter for civilian-defence use, **2861**
Dijkstra, L. J., and J. L. Snoek, propagation of large Barkhausen discontinuities, in Ni-Fe alloys, **1903**
Dikhoff, J., with F. A. Kröger, trivalent cations in fluorescent ZnS, **2228**
Dillenburger, W., phase meter for range 100 kc/s to 20 Mc/s, **1725**; 1029-line television, **1016**
—— with others, television developments by Fernseh G.m.b.H., 1939–1945, **2909**
Dingle, R. B., electrical conductivity of thin wires, **2189**
Dinsdale, A., American hearing aids, **807**
Diopère, M., h.f. heating in wood industry, **2307**
Dishal, M., design of dissipative band-pass filters, **2153**; minimum unloaded resonant-circuit *Q* for multiple-resonant-circuit filters, **(A)1355**
—— with H. Busignies, relations between speed of indication, bandwidth and signal/noise ratio in navigation and d.f., **364**
Dishington, R. H., diode phase-discriminators, **566**
Dite, W., with others, signal/noise ratio in pulse-count-modulation system, **460**
DiToro, M. J., W. Graham and S. Schreiner, speech transmission in channels of restricted bandwidth, **(A)1511**
Doak, P. E., with others, pulse statistics analysis of room acoustics, **2406**
Dobbie, L. G., corrosion of Cu wires in contact with insulating materials, **3066**
Dobson, G. M. B., physics and the atmosphere, **1912**
Dodd, S. H., H. Klemperer and P. Youtz, M.I.T. e.s. storage tube, **(A)1554**
Dodington, S. H., crystal control at 1 000 Mc/s for aerial navigation, **896**
Doehler, O., and W. Kleen, efficiency of the travelling-wave valve, **3205**
—— with others, amplification by direct electronic interaction, **333, 511**; electron bunching in v.m. valve, **510**; magnetron-type travelling-wave amplifier, **2064**
Dolinski, S., production of high frequencies by combination of low frequencies, **560**
Donal, J. S., Jr, with C. L. Cuccia, electron coupler: spiral-beam u.h.f. modulator, **1822**
Donnelly, W. B., cost reduction possibilities in industrial design, **(A)1559**
Donsker, M. D., and M. Kac, sampling method for eigenvalues of Schrödinger's equation, **3079**
Döring, H., theory of v.m. valves, **1034, 3215**
Dornhoefer, W. J., self-saturation in magnetic amplifiers, **(A)565**
Doughty, J., and others, structure of PbS, PbSe and PbTe films, **(A)2537**
Douglas, A., electrical displacement-meter, **1993**; Hammond spinet, **426**; stroboscopic a.f. tuner, **1842**
Douglas, R. W., semiconductors and their applications, **3070**
Douma, T., d.c/a.c. conversion for h.f. induction heating, **952**
—— and H. P. J. Brekoo, h.f. filament heating for cascade h.v. generator, **1527**
Dow, W. G., with H. C. Early, wind produced by arc in magnetic field, **2481**
Dowell, K. P., Type 416A microwave planar triode, **3211**
Dowling, P. H., with others, dielectric constant of a ferromagnetic ferrite, **1932**
Draffin, G. F., analysis of pulse shape, **681**
Dreyfus-Graf, J., elements and principles of the sonograph, **271**; phonetic steno-sonograph, **1330**
Drotschmann, C., internal resistance and electrolytes of primary cells, [illegible]
Druesne, M. A. A., with others, increase of *Q* and reduction of ageing for quartz crystal blanks, **375**
Druey, W., theory of RC-amplifier stage, **597**
Drummond, D. G., electron microscopy, **1741**
Dryden, J. S., and P. T. Wilson, effect of moisture on insulating materials, [illegible]
Dubois-Violette, P. L., stability of regulators and servomechanisms, **1778**
Duerdoth, W. T., design of negative-feedback amplifiers, **2176**
Dufour, C., production of thin uniform layers by evaporation, **3063**
Dugas, C., with P. Aigrain, characteristics of transistors, **1310**
Duinker, S., with G. J. Elias, oscillation phenomena, in circuit with discontinuous linear characteristic, **2447**, in nonlinear circuits, **582**
Dujardin, I., with M. Hoyaux, comparative survey of ion guns, **416**
Dumas, H., and P. Moll, terminal equipment for French P.T.T. 600-channel carrier-current telephony circuit, **2022**
Dummer, G. W. A., radar training devices for R.A.F., **(D)1417**
DuMont, A. B., quality and good engineering, **(A)1559**
Dunn, B. C., Jr, measurement of response of loop aerial in e.m. field, **(A)1338**
Dunn, S. C., network procedure for quadripoles, **2146**
Dunning, J. R., detection of nuclear radiations, **(A)1467**
Dunoyer, L., gas emission in l.v. incandescent lamps, **2226**
Dupouy, G., work carried out with magnetic electron microscope, **1474**
Durand, E., effect of arbitrary field on sphere or cylinder, **1127**; interference fringes near caustics, **344**
Dushman, S., high-vacuum technique, **896**
Dutcher, J. L., torque and speed regulation with amplidyne, **236**
Dutilh, J. R., theory of nonlinear servomechanisms, **2030**
—— with others, radio synchro-motor, **1258**
Dutton, G. F., recording and reproducing equipment, **539**
Dutton, T. S., design of phase-shifting networks for RC oscillators, **(D)1621**
Dwight, H. B., radiation-pressure theory of e.s. repulsion, **2186**
Dwork, B. M., detection of pulse in noise, **2383**
Dwork, L. E., tank-capacitor voltage in class-C amplifiers, **2460**
Dyatlovitskaya, B. I., with others, properties of Sb-Cs cathodes, **1800**

E

Early, H. C., and W. G. Dow, wind produced by arc in magnetic field, **2481**
Eastman, A. V., Fundamentals of Vacuum Tubes, **(B)2099**
Easton, A., stagger-tuned video amplifiers, **255**
Eberhard, E., R. O. Endres and R. P. Moore, counter circuits using transistors, **1092**
Ebers, J. J., with O. Heil, wide-range u.h.f. oscillator valve, **2677**
Ebert, J. E., and H. A. Finke, test equipment for u.h.f. television band, **(A)1454**; u.h.f. frequency-sweep oscillator, **2294**
Ebert, W., field-strength measurements near Geneva for 93-Mc/s f.m. broadcast transmissions, **984**
Eckart, G., field of magnetic dipole, in stratified atmosphere, **284**, in spherically symmetrical stratified medium, **2009**; propagation of e.m. waves in stratified medium, **977**; reflection of e.m. waves at discontinuity of dielectric-constant gradient, **1750, 3185**
—— and T. Kahan, solution of propagation equation by conformal transformation, **1480**
—— with T. Kahan, existence of surface wave in dipole radiation over plane earth, **2871**; Sommerfeld's e.m. surface wave, **713**
Eckersley, T. L., coupling of ordinary and extraordinary rays in ionosphere, **978**
Eckert, J. P., Jr, H. Lukoff and G. Smoliar, c.r. tube e.s. memory system, **2005**
Ecklin, J. W., open-wire line for f.m. aerial feeder, **291**
Edwards, C. M., and E. C. Johnson, Jr, electronic servomechanism simulator, **(A)2267**
Eggenberger, D. N., with P. L. Copeland, electron transit time between coaxial cylinders, **1286**
Egger, A., and H. H. Meinke, resistance measurement at h.f. by means of lossless quadripoles, **2562**
Ehrenberg, W., electrical conductivity of semiconductors, **910**
Ehrlich, S. L., with H. Sussman, magnetostriction properties of hiperco, **2790**
Eisenberg, P., with H. A. Chinn, tonal-range preferences, **802**
Eisengrein, R. H., analysis of noise in fire-control radar, **(A)1416**
Eisenstein, A., change of mutual conductance with frequency, **(D)1812**; properties of Ba$_2$SiO$_4$ oxide-cathode interface, **490**
Eldred, W. N., with W. B. Wholey, new type of slotted-line section, **1587**
Elger, H., transient response of detuned resonant circuits, **1102, (D)1374**
Elias, G. J., and S. Duinker, oscillation phenomena, in circuit with discontinuous linear characteristic, **2447**, in nonlinear circuits, **582**
Ellenberger, G., with H. Kaden, reflection-free insulating disks in coaxial cables, **309**
Ellenwood, R. C., and H. E. Sorrows, cathode-heater compensation for stabilized d.c. power supplies, **468, 1779**
Ellis, S. G., modification to R.C.A. electron microscope Type EMC, **2003**
Ellison, M. A., and M. Conway, solar flare 19th November 1949, **1911**
Elmore, W. C., fast pulse-amplifiers, **73**
—— and M. L. Sands, Electronics: Experimental Techniques, **(B)2007**
Elsasser, W. M., attenuation in a dielectric circular rod, **1080**; earth's interior and geomagnetism, **1679**; the hydromagnetic equations, **2770**
Elven, R. S., and others, Outline of Radio, Television and Radar, **(B)2954**
Emeleus, K. G., with E. B. Armstrong, h.f. oscillations in hot-cathode discharge tubes, **495**
Endesfelder, H., with H. H. Rust, measurement of small direct voltages, **1451**
Endicott, H. S., power factor measurement for capacitor paper, **144**
Endres, R. O., with others, counter circuits using transistors, **1092**
Endres, W., and H. Köhler, fluid dielectrics for u.h.f., **1708, (C)3071**
Endt, P. M., use of spontaneous voltage fluctuations for measurement of low temperatures, **3105**
England, T. S., dielectric properties of the human body at λ = 1–10 cm, **3108**
Engstrom, E. W., R.C.A. colour television system, **248**
Epaneshnikov, K. V., with others, design of complex correcting circuits for television amplifiers, **1369**
Épelboim, I., and A. Marais, macroscopic magnetic texture of permalloy tape, **906**
Eppelsheimer, D. S., with F. A. Hames, ferromagnetic Cu-Mn-In and Cu-Mn-Ga alloys, **658**
Epprecht, G. W., measurement of dead time and recovery time of G-M counters, **2864**
Erb, E., possible control methods, **1744**
Erben, J., with J. Herrmann, s.s.b. *vs* f.m. methods for power-line telephony, **895**
Erikson, P. E., C.C.I.F., Paris, 1949, **2622**
Ernst, R., Technisches Worterbuch (Deutsch-Englisch): Vol. 1, **(B)1316**
Ertel, A., effect of impurities on emission from Pt, **(A)1926**
Espersen, G. A., thermionic emission of thoria-rhenium, **2075**
Espley, D. C., transient distortion in networks, **1101**
—— and R. J. Clayton, London Birmingham television radio relay link, **1006**
Essen, L., velocity of light and radio waves, **1751, 2010**
Essigmann, M. W., with others, speech sounds and their statistical properties, **(A)1319**
Estrin, G., anisotropy of 3-dimensional array of conducting disks, **(A)1338**; effective permeability of an array of thin conducting disks, **2765**
Evans, C., hermetic sealing of transformers, **1179**
Evans, E. C., and K. E. Burmaster, Philips-type ionization gauge for pressure range 10^{-1}–10^{-7} mm Hg, **2518**
Evans, J. A., induction heating, **707**
Ewald, E. B., manufacture of metallized c.r. tubes, **1262**
Ewaskio, C. A., and O. K. Mawardi, electroacoustic phase shift in loudspeakers, **2688**
Eyfrig, R., diurnal variations of F$_2$-layer electron concentration at equatorial stations, **1681**; F$_2$-layer height and relative sunspot number, **390**

F

Facchini, U., with others, pulses in argon counters, **3126**
Fagot, J., nonlinear distortion in f.m., **1062**
Fahlenbrach, H., recent developments in magnetic materials, **3076**
Falckenberg, G., and E. Lauter, ionization of stratosphere, **626**
Familier, H., some aspects of Bode's circuit theory, **835**
Fan, H. Y., boundary layers in rectifiers, **(A)240**
—— with V. A. Johnson, energy gap in Ge, **3025**
—— with N. H. Odell, impedance of grain boundaries, in N-type Ge, **(A)1939**
—— with W. E. Taylor, high-resistance barriers at crystal boundaries in Ge, **(A)1940**
—— with others, nucleon-bombarded silicon, **(A)1938**
Fano, R. M., approximation problems in network synthesis, **2442**; broad-band matching of impedances, **1094, 1361**
Fant, C. G. M., continuously variable a.f. filter, **2691**
Farnell, G. W., with others, high-capacity matrix-commutated radio telemetry system, **(A)1467**
Farnham, P. O., checking frequency of crystals, **2566**
Fast, S., crosstalk in f.m. and ph.m. multichannel R/T, **(A)1511**
Fechner, P., space-charge resonance frequencies, of magnetron, **2873, 2660**, of multicavity magnetron, **2946**
—— with J. Ortusi, matching circuits for magnetron modulator, **562**
Feher, K., and G. Kurtze, selective RC a.f. amplifier, [illegible]
Feil, F., nonlinearity in valve circuits, **1647**
Fein, L., ultrasonic radiation from curved quartz crystals, **8**
Feinberg, R., asymmetrical multivibrators, **1110**; magnetic amplifier, **1596**

Feinstein, J., higher-order approximations in ionospheric wave propagation, 2606
Felch, E. P., with F. R. Dennis, reactance-valve modulation of phase-shift oscillators, 1022
Feldman, C. B., and W. R. Bennett, bandwidth and transmission efficiency, 454
Fel'dshteyn, A. L., energy relations for h.f. transmission line, 29
Feldtkeller, R., Einführung in die Siebschaltungstheorie der elektrischen Nachrichtentechnik, (B)1651; Einführung in die Theorie der Spulen und Übertrager mit Eisenblechkernen, (B)341; magnetic after-effect in laminated coil-cores for weak alternating fields, 1943; theory of eddy-current anomaly, 353; theory of magnetically inhomogeneous surface layers in transformer laminations, 3060; theory of $2n$-pole networks, 313
v. Felgel-Farnholz, R., with others, television developments by Fernseh G.m.b.H., 1939–1945, 2909
Felker, J. H., calculator and chart for feedback, 76
Felsen, L., with others, equivalent circuits for slots in rectangular waveguides, (A)1338
Felsenheld, R. A., with others, high-selectivity mobile receiver, (A)1501
Fenouillet, P., with G. Fuchs, h.f. bridge for cable-impedance deviations, 1972
Ferguson, K., with E. R. Laird, dielectric properties of animal tissues at m and cm λ, 1197
Ferraro, V. C. A., and W. C. Parkinson, dependence of sudden commencements on local time and geomagnetic longitude, 1142
Ferrell, E. B., statistics, for planning and analysis of experiments, (A)1559
Fett, G. H., with P. M. Kintner, magnetic amplifier, 46
Field, L. M., recent developments in travelling-wave valves, 1298; transverse-current travelling-wave amplifier and limiter, (A)1554
Field, R. F., inductors, their calculation and losses, (A)1355
Fielding, T. J., with others, Outline of Radio, Television and Radar, (B)2954
Fiet, O. O., u.h.f. television transmitting aerial, Supergain, (A)1338 and feeder system, 2425
Finch, T. R., pulse-generator/electronic-switch for visual testing of wide-band networks, 2580
Finden, H. J., frequency synthesis and measurement, 1961; precision measurement of rotation, 951
Findlay, J. W., irregularities in ionosphere E region, (A)1409
Fine, R. S., intermodulation analyser for a.f. systems, 2840
Fingerle, W., Jr, 3-kW f.m. transmitter for state police, 2923
Finkbein, U., current density and permissible heating in small transformers, 1871; modulation distortion by band-pass filters, 844
Finke, H. A., with J. E. Ebert, test equipment for u.h.f. television band, (A)1454; u.h.f. frequency-sweep oscillator, 2294
—— with A. H. Sonnenschein, mode suppression in broad-band reflex-klystron oscillators, (A)1355
Finzi, B. and M. Pastori, Calcolo Tensoriale e Applicazioni, (B)2268
Fischer, F. A., electrical and acoustic impedances and equivalent circuits of electroacoustic transducers, 2966; radiation and propagation of sound, 797; spectroscopic a.f. spectrometer, 2400
Fischer, J., Abriss der Dauermagnetkunde, (B)1947
Fischer, K., m.f. broadcasting transmitting aerials, 38
Fischler, A., G. H. Sloan and D. Goldenberg, effective phase, group, and pulse velocities of wave propagation, (A)1482
Fisher, C. J., with F. R. Abbott, graphical analysis of radiation patterns of u.h.f. aerial, 2720
Fishoff, L. A., magnetic recorder, 21
Fitch, E., pulse communication, (D)1517
—— with B. J. Starkey, mutual and self impedance of coupled parallel aerials, 2136
Fitzpatrick, J. A., and W. J. Thaler, $BaTiO_3$ coaxial capacitor for production of short-duration spark, (A)2604
Flanagan, J. L., warbler for beat-frequency a.f. oscillator, 590
Fleming H. C., transmitting amplifier for K2 carrier system, 314
Fleming, J. S., with others, radar test set for 9–9·7 kMc/s, 404
Fleming, L., blocking oscillator as variable-frequency source, 327
Fletcher, H., hearing-loss calculation from audiogram, 1065
—— and R. H. Galt, speech intelligibility and telephony, 1844, (C)2403
Fletcher, R. C., helix parameters used in theory of travelling-wave valve, 1811
Flohn, H., and R. Penndorf, stratification of atmosphere, 2210
Flood, J. E., negative-feedback amplifiers with critical damping, 2464; transient response calculation, 2172
Florida, C. D., with others, pulse-amplitude analyser, 1448
Florman, E. F., with others, source of error in radio phase-measurement systems, 2515
Foch, A., impedance of free space, 876, (C)1666
Foldy, L. L., theory of passive linear electroacoustic transducers, 537
Fonda, G. R., emission spectra of phosphors, 3056
—— with F. J. Studer, optical properties of $CaSiO_3$ phosphors, 107
Ford, L. H., with G. H. Rayner, stability of inductance standards, 926
Forestier, H., and G. Guiot-Guillain, ferrites of rare earths, 2532
Forgue, S. V., with others, Vidicon photoconductive television pickup tube, (A)1534, 2040
Forman, R., and G. F. Rouse, Mg/Ni base for oxide cathodes, (A)2070
Forrer, R., properties of Fe/Cr and Fe/V alloys, 2236
Forsbergh, P. W., Jr, phase transitions in $BaTiO_3$, 1708
Forsyth, P. A., W. Petrie and B. W. Currie, origin of 10-cm radiation from polar aurora, 2776
—— and others, radar reflections from auroras, 1688
—— with others, field stabilization for large electromagnet, 1531
Foster, G. E., Metrotype digital recording and telemetering system, 2305
Foster, H. R., and E. E. Crump, methods and apparatus for visual analysis of audio waveforms, 2690
Fowler, A. D., with others, quality rating of television images, (A)1534
Fowler, I. L., and P. R. Tunnicliffe, BF_3-filled proportional counters, 3127
Fox, R. C., F. S. Beale and G. W. Symonds, voice-operated switching for carrier systems, 1243
Francini, G., synchronization of quasi-sinusoidal oscillators, 1349
Franck, J. V., with others, synchrotron r.f. system, 2596
Franck, R. E., with others, butyl moulding insulation for small transformers, 2802
Franeau, J., u.s.w. technique and applications, 2101
—— with G. Birnbaum, measurement of dielectric constant and loss angle of solids and liquids, 397
Franklin, P., Fourier Methods, (B)2816
Franz, K., aerials, 282; shot effect in valves and limits of amplification, 518
Franz, R., propagation characteristics of 0·1-mm waves, 208
Franz, W., transmission of e.m. waves through wire grids, 204
Frayne, J. G., and H. Wolfe, Elements of Sound Recording, (B)25
Freas, R. R., direct-reading electronic counter, 1090
Freedman, S., microwave directional couplers, 1081; radio-interference elimination by off-frequency inversion, 1506
Freeman, G. P., with H. A. van der Velden, influence of red and infrared light on diamond crystal counter, 3124; photoelectric properties of diamond, 3055
Freeman, J., and W. Saraga, phase-shift calculation for filters, 1623
Freeman, J. J., field of arbitrary current distribution within waveguide 2137
French, B. K. V., continuous tuning for television sets, 1762
Freudenthal, H., mathematical problems of feedback, 2443
Fricke, H., L. Pungs and K. H. Schmitter, interference in region between two f.m. common-wave transmitters, 990
Friend, A. W., adjustments for optimum performance in magnetic recording, 1571; noise in sound-recording and -reproducing systems, (A)1319
Frisch, F. O., with A. Applebaum, small-surface microwave diffraction, 2721
Fritze, U., with J. Meixner, sound field near piston membrane, 1951
Fröhlich, H., conduction electrons in non-metallic solids, 2475; Theory of Dielectrics, (B)1674
—— and J. O'Dwyer, electronic processes in dielectrics, 1426; Time Dependence of Electronic Processes in Dielectrics, (B)2199
—— H. Pelzer and S. Zienau, properties of slow electrons in polar dielectrics, 1899
Fromageot, A., and P. Belgodère, design of stagger-tuned amplifiers, 856
—— and M. A. Lalande, band-pass crystal filters in lattice structures, 842; template method for the design of filters, 2996
Fry, D. W., and F. K. Goward, Aerials for Centimetre Wavelengths, (B)2432
Fuchs, G., and P. Fenouillet, h.f. bridge for cable impedance deviations, 1972
Füchsel, W., 25 years of broadcasting in Austria, 234
Fünfer, E., and H. Neuert, counters with pure-vapour filling, 3121
Fürth, R., spontaneous fluctuations in double-cathode valves, 1085, (C)1831
—— and D. K. C. MacDonald, current in retarding-field diodes, 2092
Furuichi, J., and T. Mitsui, domain structure of Rochelle salt, 3062

G

Gabor, D., electron optics at h.f. and at relativistic velocities, 2001
Gaillard, R., with R. Aschen, applications of a.f. analyser, 2280
Gale, H. M., and P. D. Atkinson, magnetic amplifiers, (D)45
Gales, R. S., with others, frequency selectivity of ear, 2692
Gallagher, J. C., a.f.c. for unattended transmitters, 1280
Gallay, M., with others, magnetostriction measurement with strain gauge, 2492
Gallet, R., r.f. radiation from the galaxy, 3040
Galt, J. K., B. T. Matthias and J. P. Remeika, properties of Ni-ferrite single crystals, (A)2529
—— with others, ferromagnetic resonance of Ni ferrite, (A)2485
Galt, R. H., with H. Fletcher, speech intelligibility and telephony, 1844, (C)2403
Gamble, E. H., current growth in planar diode, 1816; h.f. response of cylindrical diodes, (A)496, 2937
Gamlen, D. R., remote-control and indicating systems for airborne radio equipment, 1254
Gandin, P., and R. Champeix, cathode temperature measurement, 265
Gaponov-Grekhov, A., and M. Miller, excitation of circular waveguide by ring aerial, 1075
Garcin, J., technical repercussions of Copenhagen plan, 2343
Gardner, B. C., with R. C. Hergenrother, recording storage tube, 2942
Garfitt, R. G., with others, 3-stage electron microscope, 1742
Garlick, G. F. J., Luminescent Materials, (B)2255
—— and A. F. Gibson, dielectric changes in phosphors, 367
—— and D. E. Mason, luminescence of ZnS-Sn phosphors, 654
Garner, L. P., with others, 500-kW beam triode, (A)1554
Garrison, J. B., and A. W. Lawson, absolute noise thermometer, 947
Garwin, R. L., differential analyser for the Schrödinger equation, 2557
Gast, T., demonstrations with infrared rays, 696; development of a.c. bridges for dielectric measurements, 1456; electrometer as bridge-balance indicator, 938
Gatti, E., with others, pulses in argon counters, 3126
Gauger, R., distortionless amplification of d.c. pulses with a.c. amplifier, 2753
Gautier, T. N., with A. G. McNish, lunar ionospheric variations at low-latitude stations, 635
Gavin, M. R., electron transit time, (D)2384
Geach, G. A., review of literature on electron microscope, 432
Gebbie, H. A., P. C. Banbury and C. A. Hogarth, crystal diode and triode action in PbS, 2068
Gee, C. C., new Mullard subminiature valves, 1290
van Geertruyden, F., stability of amplidyne control circuits, 2354
Geisler, A. H., structure and properties of permanent-magnet alloys, 906
Gemperle, H., underwater sound transmitter and microphone, 2119
Genç, S., c.r.o. for investigating function of two variables, 3111
Gent, W. L. G., measurement of permittivity of liquids, 396
Genzel, L., and H. Müser, photoconductivity of PbS, 1923
Gerber, W., transalpine radio links, 1007
Gerdes, W. F., and R. C. Jorgensen, radar for hurricane tracking, 644
Gergely, G., rise and decay of luminescence of Zn_2SiO_4, 3058
Gerks, I. H., distortion due to 2-path propagation, 451
Gerlach, A. A., distortion and pass-band considerations in angular-modulation systems, (A)1355
Gerrand, J. H., radio equipment in Convair air liner, 1009
Gerson, N. C., amateur co-operation in study of sporadic-E ionization, 2212; ionosphere, large-scale sporadic-E movements in, 3044; nocturnal ionization in F_2 layer, 1148: ionospheric research, in U.S. Air Force, (A)630, mathematical problems in, (AD)632; level of atmospherics in N. and S. Canada, 3048
Geschwinde, H., abac for temperature compensation of oscillatory circuits, 1873
Getting, I. A., and others, operation of M.I.T. 350-MeV synchrotron, (A)2595
Geyger, W., d.c. amplifier for measurement of small direct voltages, 1450; feedback d.c. amplifier with grid-controlled valve converter, 2561; feedback direct-voltage valve voltmeter, 1971
Geyger, W. A., magnetic amplifier of balance-detector type, (A)2139
Gherzi, E., ionosphere and weather forecasting, 1153
Ghose, S. C., generation and analysis of ultrasonic noise, 1054
Giacoletto, L. J., beam-deflection valve for f.m. detection, 224
Gião, A., relations between electromagnetism and gravitation, 1675
Gibbings, D. L. H., with G. Newstead, error-actuated power filters, 57
Gibson, A. F., and T. S. Moss, photoconductivity of Bi_2S_3 and Bi_2Te_3, 1424
—— with G. F. J. Garlick, dielectric changes in phosphors, 367
von Gierke, H., production of edge tones by gas jets, 2112
Gilbert, E. A., equipment for instrument calibration, 686
Gilbert, J., electronic phase meter, 163
Gillette, R. H., phosphors for scintillation counters, (A)955
Gilli, M., radar for merchant navy, 1690
Gilliam, O. R., C. M. Johnson and W. Gordy, microwave spectroscopy at λ = 2–3 mm, 1668
Gillies, A. W., theory of nonlinear circuits, 308
Gillings, D. W., millisecond chronographs, 923
Gilloux, H., sound receiver for television, 767
Gilotaux, P., recent trends in disk recording, 2970
Gilvarry, J. J., and D. F. Rutland, voltage-stabilization using current-stabilized supply, 244
Ginther, R. J., with others, variation of emission spectrum of $(Zn, Be)_2SiO_4$-Mn with decay time, 2522
Ginzburg, V. L., absorption of r.f. waves in solar corona, 1398
Ginzton, E. L., and P. S. Goodwin, coaxial directional couplers with circular coupling hole, 1611
—— with others, development of 10-cm high-power pulsed klystron, (A)1554
Giordano, A. B., design of TM-mode piston attenuator, 1976
Giovanelli, R. G., emission of radiation from solar flares, 357; Hall currents, sunspots, and ejection of prominences, 617
Gisolf, J. H., ferromagnetism of metal compounds, 656, 2237; spontaneous current fluctuations in semiconductors, 667
Glagolev, V. M., standing current in whole-anode magnetron, 1826
Glaser, F. W., resistivity measurements for Fe-Si alloys, 671
Glaser, J. L., and S H. Van Wambeck, tests of diversity receiving systems, (A)1501
Gledhill, J. A., and M. E. Szendrei, theory of production of ionized layer in non-isothermal atmosphere, 2211
Glegg, K., cathode-coupled multivibrator theory, 2454
Gleissberg, W., probable sunspot variations during next cycle, 92
Glinz, C., approximate formula for C.C.I.R. night-field curves, 1758; ionospheric reflection: ground-wave scattering, 1221
Glubrecht, H., electrical computer for higher-order equations, 1442
Gluyas, T. M., 1-kW u.h.f. television transmitter, (A)1534
Goddard, N. E., contour analysis of mixer valves, 1293
Goddess, E. D., application of statistics to engineering tolerances, (A)1559
Godfrey, J. W., reproduction from disks and records for broadcasting, 274
Goebel, G., atmospheric propagation of light of different wavelengths, 1514
Goetzel, C. G., Treatise on Powder Metallurgy: Vol. 1—Technology of Metal Powders and their Products, (B)333
Gold, B., solution of steady-state f.m. problems, 309
Goldberg, B., with M. Acker, comparison of modulation methods for radio facsimile, (A)1511
Goldberg, E. A., zero and gain stabilization of wide-band d.c. amplifiers, 2458
Goldenberg, D., with others, effective phase, group, and pulse velocities of wave propagation, (A)1482
Goldin, A. S., E. R. Rohrer and R. L. Macklin, scintillation-type alpha-particle detector, 2858
Goldman, J. E., magnetostriction in alloys with preferred crystal orientation, (A)2551
—— with H. H. Plotkin, effect of tension on magnetic properties of Fe/Co, (A)2534
Goldman, S., electronic mapping of electrical activity of heart and brain, (A)1467; Transformation Calculus and Electrical Transients, (B)2271
Goldmark, P. C., brightness and contrast in television, 3182; flicker and colour-fringing phenomena in colour television, 3192
Goldsmith, H. A., with others, ferrites, 659
Goldsmith, T. T., Jr, WDTV field-strength survey, 250
Goldstein, L., with P. Parzen, current fluctuations in d.c. gas-discharge plasma, 2670; hydrostatic pressure in electron gas and electron-beam/electromagnetic-wave interaction, (A)1554
Goldsztaub, S., application of electron optics to X-ray tubes of great intensity, 1479
Goldwater, D. L., and R. E. Haddad, refractory materials as thermionic emitters, (A)1927
Gondry, R., video-frequency stage, 768, 1782
Goodrich, R. R., with others, Vidicon photoconductive television pickup tube, (A)1534, 2040
Goodwin, P. S., with E. L. Ginzton, coaxial directional couplers with circular coupling hole, 1611
Goodyer, P. A., characteristics and applications of Se and Cu_2O rectifiers, 242
Gordon, J. F., crystal-controlled frequency modulator, 2925
Gordon, W. E., with H. G. Booker, theory of radio scattering in troposphere, 1757
Gordon-Smith, A. C., calibrated piston attenuator for mm λ, 1193
Gordy, W., with others, microwave spectroscopy at λ = 2–3 mm, 1668
Görk, E., stability criteria, 2986
Gorter, E. W., magnetization in ferrites, 1931, spontaneous, 1167
Gosewinkel, M., electroacoustic apparatus using Rochelle-salt crystals, 2969
Goss, R. W., South Australian police f.m. system, 749
Got, T., stable periodic solutions of quasi-harmonic differential equations 1440
Gottlieb, I., and I. R. Mednick, crystal control for Citizens' band, 2924
Goubau, G., measurement of ionosphere layer heights, 888; surface-wave transmission lines, (A)1338; theory of cavity resonator systems, 320
—— and J. Zenneck, F.I.A.T. Review of German Science, 1939–1946: Electronics, incl. Fundamental Emission Phenomena, (B)520
Goudet, G., recent developments in amplifying valves for cm waves, 2686; travelling-wave valves, 1294, (C)1808
—— and H. Jassin, theory and technique of multipoles at u.h.f., 1882
Gough, K. A., with A. E. Bennett, influence of operating conditions on design of capacitors, 2735
Gough, M. W., v.h.f. and u.h.f. propagation within the optical range, 729
Gould, K. E., equalization of coaxial lines, (A)2152
Gouriet, G. G., high-stability variable-frequency oscillator, 1627
Gow, G. J., with F. H. McIntcsh, new 50-W a.f. amplifier circuit, 592
Goward, F. K., betatron electron injection into synchrotrons, 195
—— and others, λ/4 coaxial-line resonators for betatron-started synchrotrons, 430
—— with D. W. Fry, Aerials for Centimetre Wavelengths, (B)2432
Grace, C. H., with others, polarization of 150-kc/s waves reflected from the ionosphere, 3137
Graham, J. S. W., magnetic amplifier, 2728
Graham, W., with others, speech transmission in channels of restricted bandwidth, (A)1511
Grammelsdorff, F., and W. Guckenburg, linearization of output from reproducing head of magnetic recorder, 1332
Grammer, G., elimination of television interference with low-pass filters, 1367
Granger, J. V. N., shunt-fed flat-plate aircraft aerials, 1591
Granier, E., piezoelectric materials, 1427
Granlund, J., with L. B. Arguimbau, sky-wave .m. receiver, 734
Gray, R. O., and W. J. Strob, uses of 6BN6 beam valve in television, 1785
Green, C. E., ADP and Rochelle-salt crystals at ultrasonic frequencies 1705
Green, E., λ/4 networks, 570
Green, G. K., with others, 3-kMeV proton accelerator, 1738
Green, J. H., Jr, and V. B. Corey, analogue solution of differential equations by networks, (A)1955
Green, J. W., calculation of refractive-index profile of stratified atmosphere, 1494
Greenblatt, M. H., 'multipactor' microwave electron multiplier, 494
Greene, F. L., television interference, 1277
Greene, F. M., influence of the ground in v.h.f. field-strength measurements, 2284
—— and M. Solow, v.h.f. field-strength standards, 3090
Greene, J. C., with others, theory and applications of Si crystals for microwave mixing and harmonic generation, (A)1355
Greenwald, L. W., with J. F. Hull, modes in interdigital magnetrons, 509
Gregory, C., general operator field equations, 1895
Gregory, L. W., with I. F. Deise, 3-kW m.f. transmitter design, 1284
Grieg, D. D., and A. M. Levine, multiplex microwave radio relay, (A)1511
Griffiths, H. V., and R. W. Bayliff, electronic diversity switching, 304
Grivet, P., improvement of lens-type β-ray spectrograph, 2302
—— and Y. Rocard, feedback in analogue computer networks, 2810
Grob, B., Basic Television, (B)772
Grob, O., mains control installations of Zellweger A.G., Uster, 1744
Gröbner, W., and N. Hofreiter, Integraltafel. Erster Teil: Unbestimmte Integrale, (B)2815
Grolleau, J., hydrogen thyratrons, 502
Gross, E. P., with D. Bohm, plasma oscillations, effects of plasma boundaries in, 3027, theory of, 88, 89
Gross, J., signal-strength observations during total eclipse of sun, 730
Grosskopf, H., directional microphones with phase-shifting elements, 2967
Grosskopf, J., propagation of medium waves over inhomogeneous terrain, 2011; theory of straight aerial, 2978
Grosskurth, K., conduction mechanism in semiconductors, 909
Grosskowski, J., McLeod-type alloy-filled vacuum gauge, 366
Grotrian, W., theory of sunspot cycle, 2208
Gruenz, O. O., Jr, and L. O. Schott, portrayal of pitch of speech sounds, 12
Grumel, H., S.F.R. 10-kW s.w. transmitter, 776
Grün, A., propagation of dm waves, 3140
—— and W. Kleinsteuber, fading at dm λ due to meteorological conditions, 988
Grund, J., with V. H. Aske, improved method of frequency conversion, (A)1501
Grundfest, H., d.c. amplifier for biological research, (A)955
Grunenwaldt, J., production of plane sound waves, 798
Guastavino, G. N., with R. P. McLoughlin, lupam—ultrasonoscope locator for medical applications, 1196
Guckenburg, W., effect of magnetic-tape and ring-head characteristics on reproduction, 804
—— with F. Grammelsdorff, linearization of output from reproducing head of magnetic recorder, 1332
te Gude, H., millivoltmeter with large frequency and voltage range, 1969
Guénard, P., R. Berterottière and O. Doehler, amplification by direct electronic interaction, 511
Guenther, R., radio relay design data, 60–600 Mc/s, (A)1511
—— with V. J. Colaguori, wide-band directive aerial for 50–170 Mc/s, (A)[illegible]
Guertler, R., impedance transformation in folded dipoles, 556; matrix method of solving network problems, 2440
Guha, U. C., analysis of (h′,f) records, 1152
Guillaud, C., coercive force, in powdered Mn_2Sb, 661, in powdered Mn/Bi 670; magnetic properties of ferrites, 2528
—— and A. Barbezat, magnetic properties of Mn ferrite, 2239
—— and R. Bertrand, resistance of ferrites, 2240
—— and H. Creveaux, ferromagnetic properties of mixed ferrites, 1699; preparation and magnetic properties of Mn and Co ferrites, 1698
—— and M. Roux, properties of mixed ferrites of Ni and Zn, 906
—— R. Vautier and S. Medvedieff, magnetic properties of a Co ferrite, 1168
—— and others, ferromagnetic resonance absorption in Mn ferrite, 2484
—— with M. Sage, crystalline structure and magnetic properties of Ni/Zn ferrites, 2530
Guillemin, E. A., Mathematics of Circuit Analysis, (B)[illegible]
Guiot-Guillain, G., with H. Forestier, ferrites of rare earths, 2532
Güllner, G., protection of receiving aerials from effects of local fields, 1586
Gund, K., and W. Paul, experiments with 6-MeV betatron, 2856
Gundlach, F. W., theory of transit-time valves, 1825
Gunn, R., charge on precipitation inside thundercloud, 2607
Guthrie, A., and R. K. Wakerling, Vacuum Equipment and Techniques, (B)1945
Gutmann, F., direct-reading instrument for series resistance of capacitors, 2287; electronic instruments for chemical laboratories, 710, [illegible]
—— and L. M. Simmons, electrolytic thermistors, 45
Guttinger, P., and G. Valko, comparison of common-carrier and multiple-carrier multichannel systems, 3057
Güttner, W., hearing aid, crystal earpiece for, [illegible], e.m. earpiece for,

1574; crystal microphone for underwater sounds, **2689**
Gutzmann, F., u.s.w. broadcasting in U.S. Zone of Germany, **2899**
Guy, R. F., u.h.f. television, Bridgeport test results, **2049**, field tests, **1797**
—— and F. W. Smith, experimental u.h.f. television station, **(A)1534**
—— J. L. Seibert and F. W. Smith, u.h.f. television station KC2XAK, Bridgeport, **1795**
Guyot, G., with É. Chamagne, negative-feedback amplifiers, **863**
Guzzi, P. N., radio navigation aids at Buenos Aires airport, **2781**

H

Haantjes, J., and J. J. P. Valeton, projection television, **2643**
—— with others, Applications of the Electronic Valve in Receiving Sets and Amplifiers, **(B)991**
Haas, F., distortion meter, **937**
Haase, A. P., Type 6BN6 gated beam valve, **2932**
Hacke, J. E., Jr, approximate solution of ionosphere absorption problem, **(D)2502**; c.r.o. camera for ionosphere-height recording, **470**
Hackley, R. A., with others, loudspeakers for personal radio receivers, **(A)1319, 17[illegible]**
Haddad, R. E., with D. L. Goldwater, refractory materials as thermionic emitters, **(A)1927**
Hadfield, D., permanent-magnet focusing for television c.r. tubes, **1787**
Haegele, R. W., Ge crystal tetrode as frequency converter, **2332**
Hagenguth, J. H., General Electric h.v. laboratory, **186**
Haine, M. E., design and construction of new electron microscope, **(D)431**
—— R. S. Page and R. G. Garfitt, 3-stage electron microscope, **1742**
Halacsy, A. A., practical calculation of magnetizing force, **1662**
Halban, H., with others, high-pressure counters and their uses, **3125**
Hall, A. C., analogue computer for flight simulator, **(A)2266**
Hall, R. N., application of non-integral Legendre functions to potential problems, **384**
Halliday, D. J., geodetic measurements by radar, **694**
Hallows, R. W., television spot-wobble, **1541**
—— with H. K. Milward, limiter discriminator *vs* ratio detector, **225**
Halsey, R. J., and J. Swaffield, analysis-synthesis telephony and the vocoder, **(D)457**
Hamaker, H. C., theory of sampling inspection, **2951**
—— with P. Cornelius, rationalized Giorgi system, **867**
Hamel, G., Integralgleichungen, **(B)390**
Hamer, E. G., with W. P. Cole, multistation v.h.f. f.m. mobile communication systems, **2632**
Hames, F. A., and D. S. Eppelsheimer, ferromagnetic Cu-Mn-In and Cu-Mn-Ga alloys, **658**
Hamilton, G. E., and R. G. Artman, analysis of s.s.b. and d.s.b. transmission for television, **2911**; television transmitter lower-sideband measurements, **3086**
Hamilton, W. H., with others, magnetic-amplifier studies on analogue computer, **2731**
Hamm, F. A., lapping technique for magnetic electron lenses, **1944**
Hammans, R. H., with others, television of 1950 Oxford and Cambridge boat race, **2906**
Hampshire, R. A., and B. V. Thompson, ILS-2 instrument landing system, **2513**
Han Chang. See Chang, Han.
v. Handel, P., direction finding, wartime developments in Germany, **363**
Handel, R. R., with others, image orthicon RCA-5820, **1260, 2914**, production of, **2361**
Häni, P., 10 years of R/T in the Alps, **1515**
Harbaugh, W. E., with others, 500-kW beam triode, **(A)1554**
Harder, E. L., and others, magnetic-amplifier studies on analogue computer, **2731**
Harman, D. G., with R.E. Beam, dielectric-tube aerials, **(A)1338**
Harman, W. W., impedance of resonant transmission lines and waveguides, **1074**; R-*Q* factor, **295**; special relativity and the electron, **343**; wide-range tunable waveguide resonators, **2449**
—— and J. H. Tillotson, beam loading in small reflex klystrons, **787**
Harmans, J., amplifier bandwidth control, **860**
Harmegnies, P., application of electronic switching to c.r.o., **1602**
Harmon, R. N., u.h.f. coverage in Pittsburgh, **2015**
Harnischmacher, E., effect of sun on E layer, **1682**
Harnwell, G. P., Principles of Electricity and Electromagnetism, **(B)1673**
Harradon, H. D., bibliography on geophysics, **610**
Harriman, M. W., and S. B. Williams, comparative visibility of positive- and negative-signal c.r. traces, **2386**
Harrington, E. L., improved Hg diffusion pump, **652**
Harrington, J. V., errors in phase-shift telemetry system, **(A)1992**
—— with E. W. Bivans, electronic storage system, **(A)1441**
Harris, C. M., with V. O. Knudsen, Acoustical Designing in Architecture, **(B)2705**
Harris, D. B., product phase modulation and demodulation, **3159**
—— and D. O. McCoy, product phase modulation and demodulation, **(A)1511**
Harris, E. J., with P. O. Bishop, d.c. amplifier for biological application, **2174**
Harris, I. A., space-charge smoothing of shot fluctuations in triodes at v.h.f., **2674**
Harris, W. A., with others, pencil-type u.h.f. triodes, **501**
Harrison, E. B., square-wave testing of a.f. transformers, **1964**
Harrison, S. W., low-noise travelling-wave valve, **2059**
—— with R. G. E. Hutter, spot-distortion correction in c.r. tubes, **1823**
Hart, E. D., with others, radar test set for 9–9·7 kMc/s, **404**
Hart, S. V., and I. W. Rozian, thickness gauge for moving material, **2852**
Hartig, H. E., and R. F. Lambert, attenuation of transverse acoustic waves in a slotted rectangular waveguide, **1057**
Hartley, R. V. L., matter, a mode of motion, **3018**; reflection of diverging e.m. wave by gyrostatic medium, **3019**
Hartman, W. H., outphasing system of modulation, **229**
den Hartog, H., speed of G-M counters, **180**
—— and F. A. Muller, ion mobilities in G-M counters, **700**
—— F. A. Muller and C. S. W. van Rooden, electron mobilities in G-M counters, **178**
Hartree, D. R., transients in electronic valves, **1806**
Hartsfield, W. L., S. M. Ostrow and R. Silberstein, back-scatter observations by the C.R.P.L., **2325**
Hartshorn, L., Radio-frequency Heating, **(B)973**
Hartz, T. R., and A. van der Ziel, square-wave modulation in microwave spectroscopy, **1905**
Harvard University, Computation Laboratory, Tables of Inverse Hyperbolic Functions, **(B)2817**; Tables of the Bessel Functions of the First Kind of Orders Fifty-Two through Sixty-Three, **(B)2819**
Harvey, F. K., with W. E. Kock, structures for refracting sound waves, **5**
Harvey, N. L., analysis of radio navigation and detection systems, **(A)1416**; combined slot aerial and resonant circuit, **2709**
Haslam, R. N. H., with others, field stabilization for large electromagnet, **1531**
Hasse, A. P., Type-6BN6 gated-beam limiter-discriminator valve, **1808**
Hässler, G., carrier-frequency technique in Germany, 1935–1945, **2839**
Haughawout, J., television modulator, **1259**
Haupt, L. M., solution of simultaneous equations by means of a.c. network calculator, **3088**
Havelka, J., television in Czechoslovakia, **251**
Hawkins, H. C., testing of radioteletype converters, **(A)1454**
Hawkins, J. E., Jr, and S. S. Stevens, masking of pure tones and speech by white noise, **1063**
Hawley, M. S., reciprocity pressure response formula, **1062**
Haworth, L. J., with others, 3-kMeV proton accelerator, **1738**
Hay, H. G., with G. G. Macfarlane, wave propagation in slipping stream of electrons, **2375**
Haycock, O. C., E. C. Madsen and S. R. Hurst, propagation of e.m. waves through ground, **981**
Haynes, H. E., and H. E. Roys, variable-speed turntable for use in pickup calibration, **1578, 2701**
Haynes, J. R., with others, hole injection in Ge, **380**
Hazzard, G. W., ultrasonic absorption in organic liquids, **1056**
Hedrick, L. C., h.v. square-wave generator, **851**
Hees, G., effects of Ni-core impurities on emission of oxide cathodes, **(A)1554**
—— with others, effect of Ni-core impurities on emission of oxide cathodes, **(A)2074**
Heidenreich, R. D., electron microscopy and diffraction, **433**
Heightman, D. W., communication-receiver design, **1235**
Heil, O., and J. J. Ebers, wide-range u.h.f. oscillator valve, **2677**
Hellmann, A., multichannel m-λ radio links, **3162**
Heins, A. E., diffracted beams in metal lenses, **(A)1338**
Heins, H., Ge-crystal triode, **1312**
Heiser, W., analysis of synchronizing-signal separator, **2649**
Hellar, M. W., Jr, precision measurement of rotation speed, **417**
Heller, R. A., with E. G. Widell, electron emission of oxide cathodes, **(A)1138**
Hellingman, J. E., with others, fluorescence of ZnS-Cu, **1425**
Hellyar, P. R., design of Australian a.m. broadcasting transmitters, **775**
Helmholz, A. C., with others, synchrotron r.f. system, **2596**
Hemardinquer, P., applications of magnetic recorders, **2316**; ultrasonics in therapy, **2301**
Hemingway, A. V., magnetic amplifiers, **(A)1998**
Henderson, W. J., and P. A. Redhead, N.R.C. electron cyclotron, **196**
—— with others, electron cyclotron, **1472**
Henisch, H. K., with P. C. Banbury, frequency response of PbS transistors, **2672**
Henkel, R. L., and B. Petree, h.v. power supply for e.s. analyser, **469**
Henkels, H. W., experimental examination of theory of Se rectifier, **2798**
Henninger, P., dielectric investigations on paper, **3067**
Henrich, L. R., D. C. Sewell and J. Vale, operations of the 184-in. cyclotron, **962**
Henry, J., sensitivity and fidelity of microphones, **538**
Henry, R., measurement of the pumping rate of rotary pumps, **3054**
Hercock, R. J., and D. M. Neale, use of cold-cathode relay valves with high-resistance grid/cathode circuits, **1354**
Hereford, F. L., spurious discharge in parallel-plate counters, **1201**
Hergenrother, R. C., and B. C. Gardner, recording storage tube, **2942**
Herman, R. C., and C. F. Meyer, rise in brightness of infrared-sensitive phosphors, **368**
Herold, E. W., signal/noise ratio in u.h.f. receivers, **2882**; testing valves for residual gas, **486**
Herr, D., with R. McCoy, modern methods of servo synthesis, **(A)1355**
Herr, D. L., universal precision resolvers, **(A)1526**
Herr, R., magnetic-record duplication process, **2804**
Herreng, P., and J. Ville, pulse-echo method for impedance irregularities of coaxial cables, **2278**
Herring, C., theory of transient phenomena in excess semiconductors, **378**
Herrmann, J., and J. Erben, s.s.b. *vs* f.m. methods for power-line telephony, **995**
Hershberger, W. D., and L. E. Norton, servo method of frequency stabilization with spectral lines, **2140**
Herzog, W., oscillators of high frequency-constancy, **848**; Siebschaltungen mit Schwingkristallen, **(B)3016**
Hess, H. A., periodic fading of s.w. signals, **3143**; round-the-earth s.w. signals, **3139**
Hesse, M. B., calculation of magnetic-lens fields, **2313**
Hesse, W., tropopause fluctuations due to influxes of cold air, **624**
Hessel, J., and H. F. Meyer, Signal Corps h.f. radio communication research and development, **(A)1511**
Hetrick, D. L., TM-mode propagation in metal tube containing imperfect dielectric, **2419**
Hettich, A., dimensions and noise of resistors, **1601**
Heusinger, P. P., velocity of sound in H_2O and D_2O at 0°–100°C, **796**
Hey, J. S., radio astronomy, **91**; r.f. solar radiation, **(A)356**
Heydt, H. L., measurement of secondary-electron emission from dielectric surfaces, **3028**
Heymann, F. G., breakdown in cold-cathode tubes at low pressure, **873**
Hicks, F., Jr, with V. A. Babits, electro-optical filters for colour television, **(A)1534**
Hiebert, A. G., KENI broadcasting station, Anchorage, Alaska, **1774**
Higgins, H. J., with R. D. Teasdale, e.m. waves in circular waveguides containing two coaxial media, **2707**
Higgins, J., with others, automatic exposure control for aerial photography and television, **1999**
Hilburn, E. D., 2-kMc/s and 7-kMc/s relays, **2896**
Hill, F. L., and C. W. Brown, universal visual valve tester, **411**
Hilliard, J. K., miniature capacitor-microphone Type 21B, **(A)1319, 1849**
Hillier, J., and E. G. Ramberg, contrast improvement in electron microscopy, **3117**
Hilst, G. R., and G. P. MacDowell, radar measurements of initial growth of thunderstorm rain cells, **2220**
Hine, A., Admiralty transmitting magnetic compass, **2004**
Hine, G. J., automatic isodose recorder, **(A)955**
Hintenberger, H., magnetic cylindrical lenses with image-distortion correction, **2312**
Hinton, W. R., design of phase-shifting networks for RC oscillators, **840, (D)1621**; phase-shift oscillator, **(D)1378**
von Hippel, A., ferroelectricity, domain structure and phase transitions of $BaTiO_3$, **3064**
—— with B. Matthias, domain structure and dielectric response of $BaTiO_3$ single crystals, **2250**
Hirsch, C. J., distance-measuring equipment, pulse-multiplex system for, **365**, 100-channel, traffic capacity of, **1918, 2780**
Hirsh, I. J., and F. A. Webster, interaural phase effects on binaural threshold, **11**
Hlavsa, V., compensator for a.c. measurements, **152**
Hoagland, K. A., television c.r. tubes, **2943**
Hobbs, C. F., and W. B. Bishop, techniques for close channel spacing at v.h.f., **(A)1511**
Hochrainer, H., new frequency-meter and applications, **161**
Hoekstra, H., with A. L. Biermasz, strain gauges Types GM4472 and GM4473, **418**
Hoffenberg, M. S., amplidyne performance and design, **239**
Hofreiter, N., with W. Gröbner, Integraltafel. Erster Teil: Unbestimmte Integrale, **(B)2815**
Hofstadter, R., crystal counters, **2860**
Hogan, A. W., use of image-converter tube for high-speed shutter action, **(A)1467**
Hogarth, C. A., with others, crystal diode and triode action in PbS, **2088**
Hogg, R. W., triplet-reflector array, **1342**
Höhn, R., atmospheric pressure and temperature gradients over central Europe, **640**
Hoisington, W. F., prediction of 2-m-band transmission conditions, **212**
Holden, W. H. T., with W. A. Depp, circuits for cold-cathode glow tubes, **489**
Hollinghurst, F., and C. W. Sowton, v.h.f. point-to-point communication, **(D)1521**
Hollinsworth, V. E., crystal control of chronograph motors, **1185**
Hollis, J. L., continuously-tuned 50-kW transmitter, **1551**
Hollis, W. C., Citizens' band signal generator, **164**
Hollmann, H. E., dynamic sensitivity of c.r.o. at v.h.f., **1461**; semiconductive colloidal suspensions, **2247**
Holloway, D. G., p.c.m., **1519**
Hollway, D. L., electron-beam decimal-counter tube, **2374**
Holmes, L. C., techniques for improved magnetic recording, **23**
Holmes, L. S., with others, λ/4 coaxial-line resonators for betatron-started synchrotrons, **430**
Holshouser, D. F., with C. G. Lob, radial-beam v.m. microwave valve, **2947**
Holtum, A. G., Jr, permittivity measurement at 100–1000 Mc/s, **3092**
Holzwarth, H., p.c.m. and distortion with logarithmic sampling, **1008**; p.m. systems for multichannel radio links, **3166**
Homer, H. H., with others, study of oxide cathodes for fluorescent lamps, **(A)2055**
Hon Yung Sen, stratification of ionosphere F_2 layer over Singapore, **1151**
Honerjäger, R., e.m. waves in metal tubes, **278**, theory of, **2708**
—— with O. Schäfer, lines and circuit elements for microwave measurements, **3068**
Honnell, M. A., 1949 Atlanta broadcast engineers' conference, **1045**
—— and M. D. Prince, television-image reproduction by v.m. method, **(A)1534**
Honnor, W. W., demonstration of f.m. broadcasting equipment, **535**
Hoogenstraaten, W., and F. A. Kröger, fluorescence efficiency of willemite phosphors, **105**
—— with F. A. Kröger, fluorescence in Zn and Zn-Be silicates, **106**
Hooper, J. E. N., and A. A. Kippax, radar echoes, from falling rain: the 'bright band', **2221, 2222**, discussion, **(D)3043**
Hoover, M. V., with others, 500-kW beam triode, **(A)1554**
Hopf, L., Introduction to the Differential Equations of Physics, **(B)2272**
Hopkins, E. G., valves with mutually bombarding oxide cathodes, **2290**
Hopper, F. L., noise in sound-recording systems, **(A)1319, 1570**
Hoptroff, V. G., and G. J. R. Rosevear, wire coverings and sleeving for Service equipment, **2245**
Horwood, W., positive-streamer mechanism of spark breakdown, **87**
Horrell, M. W., with R. G. Kloeffler, Basic Electronics, **(B)974**
Horton, C. W., and R. B. Watson, diffraction of cm waves by semi-infinite screen, **1219**
—— F. C. Karal and C. M. McKinney, radiation patterns of dielectric rods, **(A)1867**
—— with R. B. Watson, diffraction of radar wave by conducting wedge, **3136**
Horton, G. P., with others, square-law rectifier circuits for meters, **3096**
Horton, W. H., J. H. Jasberg and J. D. Noe, distributed amplifiers: experimental results, **2750**
Hoth, D. F., with H. M. Pruden, vibrating-reed selective-calling system, **740**
Houstoun, R. A., measurement of velocity of light, **1896, 2759**
Houwink, R., Elastomers and Plastomers: their Chemistry, Physics and Technology, **(B)3078**; Fundamentals of Synthetic-Polymer Technology in its Chemical and Physical Aspects, **(B)3077**
Howard, W. J., with L. T. Sogn, production of very thin quartz plates, **1178**
Howells, G. A., with others, pulse-amplitude analyser, **1448**
Hoyaux, M., and I. Dujardin, comparative survey of ion guns, **416**
Hoyle, F., Some Recent Researches in Solar Physics, **(B)2509**
Hu, Han C., mode coupling by slots in wall of cavity resonator, **2746**
Huber, H., with others, electron bunching in v.m. valve, **510**; magnetron-type travelling-wave amplifier, **2064**
Hudson, A. C., low-noise input circuits, **(D)2619**
Hudson, R. P., high-field small electromagnet, **912**
Huerta, A. F., graphical methods for impedance matching, **2150**
Hufford, G. A., anomalous properties of equiphase contours, **2516**
Hug, A., design of magnetic circuits for permanent magnets, **3072**
Huggins, W. H., frequency- and time-domain viewpoints in circuit design, **(A)1355**
Hughes, D. H., v.h.f. radio equipment for mobile services, **1247**
Hughes, H. A., electronic instruments in diagnostic medicine, **1207, (D)2588**
Hughes, J. V., velocity of e.m. waves and permittivity of air, **(A)2489**
Hulburt, E. O., with M. H. Johnson, diffusion in ionosphere, **(A)2505, 3045**
Hull, J. F., external-cathode inverted magnetron, **(A)1554**
—— and L. W. Greenwald, modes in interdigital magnetrons, **509**
Hulst, G. D., with H. E. Beste, noise-elimination circuit, **(A)1534**
van de Hulst, H. C., attenuation of plane waves by obstacles, **601**
Hung, C. S., thermionic emission from oxide cathodes, **1304**
Hunt, A. H. F., with K. D. Bomford, survey of modern h.f. transmitting valves, **2058**
Hunter, L. P., Type-A transistor characteristics, **1311**
Huntington, H. B., with W. J. Price, acoustical properties of anisotropic materials, **1049**
Hurst, C., with H. Ashcroft, transit-time correction factor for cylindrical noise diodes, **499**
Hurst, S. R., with others, propagation of e.m. waves through ground, **981**
Hussey, L. W., nonlinear-coil generators of short pulses, **1351**
Hutcheson, J. A., possible power applications of transistors, **(A)1026**
Hüter, T., and R. Pohlman, optical measurement of ultrasonic absorption, **7**
Hutner, R. A., with D. S. Saxon, electronic properties of crystal model, **878**
—— with others, conduction and emission mechanism of Ba/Sr oxide cathodes, **2071**
Hutter, R. G. E., and S. W. Harrison, spot-distortion correction in c.r. tubes, **1823**
Huxley, L. G. H., ionospheric cross-modulation at oblique incidence, **1230**
—— and J. A. Ratcliffe, ionospheric cross-modulation **211, (D)2327**

I

Iams, H., simulation of propagation problems, **2914**
Icole, J., multiplex and theory of communications, **3156**
—— and G. Potier, C.N.E.T. pulse multiplex R/T equipment, **997**
Il'gekit, F. E., and K. V. Bazhenov, suppression of radio interference from h.f. induction-heating oscillators, **1506**
Imre, Z., hum in valves with a.c. heating, **1036**
Imyanitov, I. M., measurement of e.s. field, **927**
Indjoudjian, M., high-stability crystal oscillator, **1107, (C)1629**; response of linear system to arbitrary stimulus, **1364**
van Iperen, B. B., helix resonance in u.h.f. oscillators, **2944**
Irons, H. R., with E. O. Schonstedt, airborne magnetometer for measuring earth's total field, **697**
Isaacs, P., with others rise times of photomultiplier voltage pulses, **2664**
Isay, G., calculation of RC oscillators, **2163**
Isted, G. A., with J. S. Kojan, ionospheric storm warning service, **2321**
—— with G. Millington, ground-wave propagation over land/sea boundary, **2572**
Istvánffy, E., dipole impedance measurement by reflection method, **811**
van Itterbeek, A., and P. Slootmakers, ultrasonic absorption in water and in salt solution, **528**
Ives, R. L., G-M counter for lecture use, **2608**; sensitive resonance indicator, **2885**
Ivey, H. F., cathode field in diodes, **780**; thermionic electron emission from carbon, **604**
—— and C. L. Shackelford, thermionic emission calculations, **(A)1902**
Iyengar, B. R. Y., with S. K. K. Jatkar, permittivity of quartz and of fused silica, **3065**

J

Jackson, W., Heaviside's e.m. theory, **(A)2194**, Heaviside's operational calculus, **2258**
—— with J. G. Powles, dielectric properties of high-permittivity materials at cm λ, **121**
Jacob, J. E. B., television transmission monitors, **2087, 2290**
Jacob, L., field in electron-optical immersion objective, **1210**
Jacobs, H., and J. Martin, effect of cathode temperature in glow discharges, **2763**
—— and B. Wolk, gases evolved from oxide cathodes, **492**
—— G. Hees and W. Crossley, effect of Ni-core impurities on emission of oxide cathodes, **(A)2074**
Jacobs, R. B., measurement and control of leakage in high-vacuum systems, **898**
Jacoby, D. L., with others, p.c.m. methods, **(A)1511**
Jaeger, J. C., and K. C. Westfold, transients in ionized medium and solar noise, **1678**
Jahn, H., and H. Kopfermann, theory of radial oscillations of electrons in electron accelerator, **2592**
James, H. M., and G. W. Lehman, potential fluctuations in semiconductors, **(A)2476**
Jamieson, R. T., amplifier for bioelectric recording, **74**
Janes, R. B., R. E. Johnson and R. R. Handel, image orthicon RCA-5820, **1260, 2914**, production of, **2361**
Janis, P., klystron oscillators covering range 600–7000 Mc/s, **2184**
Jansen, C. G. J., with others, potential distribution in pulsed oxide cathodes, **2067**
Jasberg, J. H., with others, distributed amplifiers: experimental results, **2750**
Jasmin, B., with G. Goudet, theory and technique of multipoles at u.h.f., **1882**
Jastram, P. S., and G. P. McCouch, video-frequency noise-spectrum analyser, **165**
Jatkar, S. K. K., and B. R. Y. Iyengar, permittivity of quartz and of fused silica, **3065**
Jaynes, E. T., and E. P. Wigner, electronic theory of ferroelectrics, **(A)2479**
Jefferson, H., transient response of regulator chain, **1370**
Jeffery, E., output impedance control, **(D)1837**
Jeffries, R. J., time constants for RC differentiating and integrating circuits, **1108**
Jellinghaus, W., d.c. amplifier as power amplifier and temperature regulator, **2990**
Jenkins, E. R., chart for design of wide-band amplifiers, **2173**
Jenkins, R. O., with M. Michaelis, portable G-M counter, **1200**
Jenks, A. E., flight testing of VOR ranges, **2294**
Jenssen, M., radiation from overhead transmission lines, **2340**
Jepsen, R. L., influence on magnetron operation of cathode emission properties, **(A)2098**
Jessel, M., and R. Wallauschek, propagation along helical delay line, **1856**
Jeudon, A., with others, radio synchro-motor, **1255**
Jeynes, E., with D. G. Tucker, nonlinear effects in rectifier modulators, **(D)1569**

Jeso, M., with others, voltage discriminator for d.f., 895
Job, F., general formulae for feedback amplifiers, 2462
Johannesson, N. O., phase-shift calculation, 1624
Johanson, A. E., tuned-anode multivibrators, 2165
John, U., constants of electroacoustic transducers, 2965
Johns, H. E., with others, field stabilization for large electromagnet, 1531
Johnson, B. R., with others, television synchronizing-signal generator, 760
Johnson, C. F., miniature portable c.r.o. recorder, 407
Johnson, C. M., with others, microwave spectroscopy at λ = 2–3 mm, 1668
Johnson, E. C., Jr, with C. M. Edwards, electronic servomechanism simulator, (A)2267
Johnson, E. O., and L. Malter, grid-potential variations and recovery time of thyratrons, 2676
—— with L. Malter, grid resistance and recovery time of thyratrons, 2675
Johnson, L. J., and H. G. Schafer, magnetic-amplifier frequency control for alternator, (A)2355
Johnson, M. H., and E. O. Hulburt, diffusion in ionosphere, (A)2505, 3045
—— and others, single-pulse voltmeter, 939
Johnson, P. D., induction furnace for high-temperature ceramic research, 187
Johnson, R. E., with others, image orthicon RCA-5820, 1260, 2914, production of, 2361
Johnson, V. A., and H. Y. Fan, energy gap in Ge, 3025
—— and K. Lark-Horovitz, Hall-effect formulae for impurity semiconductors, 2491
—— R. N. Smith and H. J. Yearian, Si and Ge rectifiers, theory of, 1941
Johnson, W. C., and F. W. Latson, analysis of transients and feedback in magnetic amplifiers, 1873
Johnston, D. L., differential amplifiers, (D)2169
Jolly, W. P., vacuum gauge using Pirani cooling of W filament, 1922
Jones, A. Taber, bibliography for acoustics, 1, 521, 1047, 1838, 2395, 2682
Jones, C. R., Facsimile, (B)2656
Jones, F. E., and E. C. Cornford, velocity of cm waves as function of path height, 298
Jones, J. G., with M. W. Jones, correlation between F-layer oscillations and surface pressure, 1683; tidal effects in the F layer, 634
Jones, L. F., H. J. Schrader and J. N. Marshall, pictorial display in aircraft navigation and landing, 1694
Jones, M. W., and J. G. Jones, correlation between F-layer oscillations and surface pressure, 1683; tidal effects in the F layer, 634
Jones, R. F., low-level atmospheric ducts, 2329; radar echoes, 3041, 3042, (D)3043; thunderstorm tracks by radar, 2778
Jones, S. S. D., wide-angle microwave lens, 2723
Jones, W. B., and others, particle injection into accelerators, 1471
Jongen, H. F., with J. Clay, solar flare, 19th Nov. 1949, and cosmic rays, 3039
Jonker, C. C., with J. Blok asymmetrical multivibrator circuit, 3006
Jonker, G. H., and J. H. van Santen, ferroelectricity of titanates, 1942
Jonker, J. L. H., computation of electrode systems with aligned grids, 2095; ribbon-beam valves, 1801, 3213
—— and A. J. W. M. van Overbeek, ϕ-detector, a new detector valve for f.m., 505
—— with G. Diemer, low-distortion power valves, 484; secondary-emission valve, 2381
Jorgensen, R. C., with W. F. Gerdes, radar for hurricane tracking, 644
Josephs, H. J., Heaviside's unpublished notes, (A)2178
Jourdan, J., measurement of dielectric constants in range 50 kc/s–100 Mc/s, [illegible]
Julian, R. S., and A. L. Samuel, co-ordinate c.r. tubes for use with e.s. storage tubes, 2867
Juman, L., recent patents on accumulators, 3177
Jupe, J. H., c.r. tube presentation for infrared spectrometer, 177; ultrasonics, 269
Juster, F., coil design for television receivers, 567; design of band-pass filters, 1099

K

Kac, M., with M. D. Donsker, sampling method for eigenvalues of Schrödinger's equation, 3079
Kaden, H., and G. Ellenberger, reflection-free insulating disks in coaxial cables, 809
Kaenzig, W., atomic positions and vibrations in the ferroelectric BaTiO$_3$ lattice, [illegible]
Kafka, H., application of Maxwell's second law, 605
Kahan, T., interferometer for microwaves, 945; study of waveguide discontinuities, 1077; variational method for studying wave equation, 3080
—— and G. Eckart, Sommerfeld's e.m. surface wave, 713, existence of, in dipole radiation over plane earth, 2871
—— and A. Kwartiroff, pulse counter with scaling-down circuit, 831
—— with G. Eckart, solution of propagation equation by conformal transformation, 1480
Kahn, D. A., analysis of relay servomechanisms, (A)1252
Kaiser, T. R., capture of particles into synchrotron orbits, 960
—— and J. L. Tuck, electron capture and phase stability in 14-MeV synchrotron, 961
Kallmann, H. E., square-wave synthesis of high power sawtooth waves, 1383
Kamen, I., trends in television receiving-aerial design, 1085
Kämmerer, H., distortion with iron-cored coils, 829
Kammerloher, J., Elektrotechnik des Rundfunktechnikers, Teil 1: Gleichstrom, (B)2110; permeability of premagnetized choke coils, 568
Kamphoefner, F. J., feedback in v.h.f. and u.h.f. oscillators, 2451
—— with C. Clark, panoramic sweep circuits, 68
Kanberg, H., pulling-in range for valve oscillator controlled by harmonic, [illegible]
Kandoian, A. G., and A. M. Levine, u.h.f. multiplex broadcasting system, 996
Kaplan, S. M., and R. W. McFall, statistical properties of noise applied to radar range performance, (A)1416
Kappeler, H., telephone communication with vehicles, 2350
Kapur, P. L., with O. M. Parkash, temperature dependence in G-M counters, 1963
Karakash, J. J., and D. E. Mode, coupled-transmission-line microwave band-pass filter, 1368
Karal, F. C., with others, radiation patterns of dielectric rods, (A)1867
Karelitz, M. B., with others, Radar Scanners and Radomes, (B)651
Katsenelenbaum, B. Z., long dielectric cylinder, asymmetrical oscillations in, 1131, symmetrical excitation of, 1130
Katz, J., new class of switching tubes for digital applications, (A)1554
Katz, L., and others, field stabilization for large electromagnet, 1531
Kaufmann, A., and P. Mériau, galvanometer theory, 2263
Kautter, W., crystal filter with variable selectivity and constant gain, 2740
Kautz, W. H., applications of integral approximation method of transient evaluation, (A)1855
Kay, H. F., and P. Vousden, symmetry changes in BaTiO$_3$ at low temperatures, 374
Kazantseva, M. V., reciprocity calibration of microphones, 1060
Kearney, J. W., with others, theory and applications of Si crystals for microwave mixing and harmonic generation, (A)1355
Keen, A. W., automatic stabilization of amplifier gain, 3010; integration method of linearizing exponential waveforms, 328; negative-resistance characteristics, 2137; The Principles of Television Reception, (B)1548, (B)3194
Keigher, B., with others, p.c.m. methods (A)1511
Kellaway, F. W., with S. W. Amos, Radio Receivers and Transmitters, (B)2330
Kelleher, K. S., relations between wave fronts and reflector surface, 2128
Keller, A. C., and L. G. Bostwick, vibrating-reed selectors for mobile radio systems, 756
Kells, W., calculation of inductance of circular conductors and close- and open-wound solenoids, 2436
Kelso, J. M., Lorentz polarization term and vertical-incidence absorption, (A)638; r.f. propagation in curved ionosphere, (A)1482, 2913
—— with others, polarization of 150-kc/s waves reflected from the ionosphere, 3137
Kennaugh, E., scattering of plane e.m. waves by conducting hemisphere or hemispherical shell, (A)[illegible]
Kennedy, F., and H. G. Rudenberg, wide-band chain amplifier, 584
—— with H. G. Rudenberg, 200-Mc/s travelling-wave chain amplifier, 585
Kent, E. L., tone source for standard pitch, 526
Kern, H. E., and R. T. Lynch, diode studies of oxide-coated cathodes, (A)2076
—— with others, thermionic properties of dense oxide cathodes, (A)2078
Kerns, D. M., analysis of the d.c. bolometer bridge, 1728; application of network equations to waveguide problems, 56
Kerst, D. W., and others, 80-MeV model of 300-MeV betatron, 2593
—— with others, performance of 300-MeV betatron, (A)2594
Kessler, G., variation of cathode current with heating power, 1805
Kessler, W. J., reciprocal aspects of transient and steady-state concepts, 1880
—— and S. E. Smith, atmospheric waveform receiver, (A)1501
Khastgir, S. R., and R. Roy, waveforms of atmospherics, 893
Khaykin, S. E., and B. M. Chikhachev, solar r.f. radiation during eclipse, May 1947, 1135, [illegible]
Khokhlov, R. V., with P. E. Krasnushkin, spatial beating in coupled waveguides, 30
Kieffer, J., with G. Trébuchon, physics of glass/metal sealing, 2253
Kiely, D. G., reflection coefficient of water at λ 8·7 mm, 899
Kilburn, T., Manchester University digital computer, 133
King, A. P., radiation characteristics of horn aerials, 1590
King, D. D., two simple v.h.f. impedance bridges, 1457
King, R., aerials and open-wire lines, 281; theory of *N* coupled parallel aerials, 1585
—— and K. Tomiyasu, terminal impedance and generalized 2-wire-line theory, 28
—— with C. H. Papas, input impedance of wide-angle conical aerials, 288; surface currents on infinite cylinder excited by axial slot, 2190
Kingston, R. H., resonant circuits with time-varying parameters, 583
Kintner, P. M., and G. H. Fett, magnetic amplifier, 46
Kippax, A. A., with J. E. N. Hooper, radar echoes, from falling rain: the 'bright band', 2221, 2222, discussion, (D)3043
Kirby, H. D. B., s.s.b. radio communication, 2623
Kirby, P. L., electrical conduction in glass, 2801
Kircher, R. J., with R. M. Ryder, circuit aspects of transistor, 334
Kirke, H. L., ground-wave field-strength calculation, (D)732
Kirschstein, F., Nyquist's stability criterion, 824; simultaneous a.m. and f.m. of carrier wave, 3158
Kisun'ko, G. V., propagation in waveguides with abrupt changes of cross-section, 1078
Kittel, C., physical theory of ferromagnetic domains, 1129; theory of magnetic dispersion in ferrites, (A)2487
—— with others, ferromagnetic resonance absorption in Mn ferrite, 2484
Kiver, M. S., Television Simplified, (B)2921
Kleen, W., amplification and bandwidth in multistage amplifier, 861; t.r. switching valves, 1029
—— with O. Doehler, efficiency of the travelling-wave valve, 3205
—— with others, amplification by interaction between electron beams, 333; electron bunching in v.m. valve, 510; magnetron-type travelling-wave amplifier, 2064
Klein, M. J., and R. S. Smith, theory of magnetization of thin ferromagnetic films, (A)2486
Klein, W., connection between recurrent networks and radio filter circuits, 2999; Tchebycheff functions, 2997; wave propagation studies in the Alps, 3163
Kleinsteuber, W., with A. Grün, fading at dm λ due to meteorological conditions, 963
Klemperer, H., with J. T. de Bettencourt, beacon technique for identifying propagation paths, 2873
—— with others, M.I.T. e.s. storage tube, (A)1554
Klemt, A., h.f. curve tracer for 460–480 kc/s and 10·0–11·5 Mc/s, 3100; mixing with detectors, 1634; negative-feedback valve as controllable resistor, 2992
Klick, C. C., with others, variation of emission spectrum of (Zn,Be)$_2$SiO$_4$-Mn with decay time, 2522
Klimushev, B. Ya., with others, design of complex correcting circuits for television amplifiers, 1369
Kloeffler, R. G., Industrial Electronics and Control, (B)2829
—— and M. W. Horrell, Basic Electronics, (B)974
v. Klüber, H., solar corona, 1403
Klug, H. P., with others, dead-time and nonlinearity of G-M-counter X-ray spectrometer, 181
Knapton, J. H. and L. D. Stevens, gate-type shifting register, 675
Kneissler, L., Die Maxwellsche Theorie in veränderter Formulierung (B)2201
Kneschke, A., electron motion in alternating magnetic fields, 3021
Knight, H. de B., hot-cathode thyratrons, 504
Knighting, E., elements of anomalous radio propagation, 3133
Knol, K. S., e.m. waves in rectangular waveguides, 1860
—— and G. Diemer, rubber model for studying e.m. waves in rectangular waveguides, 1861; spontaneous fluctuations in double-cathode valves, 791
—— and A. Versnel, suppression of shot-effect noise in triodes and pentodes, 516
—— with G. Diemer, frequency conversion by phase variation, 1759; total-emission conductance measurements at λ 15 and 35 cm, [illegible]
—— with A. van der Ziel, power gain and bandwidth of feedback amplifiers, 1646
Knoop, E., and W. Kroebel, ignition and discharge processes in gas triodes, 3212
Knöpfel, —, S.W. Germany u.s.w. network, 2901
Knudsen, V. O., and C. M. Harris, Acoustical Designing in Architecture, (B)[illegible]
Koch, A. R., Citizens' band transmitter, 774
Koch, H. W., with others, 80-MeV model of 300-MeV betatron, 2593
Kock, W. E., waveguide applications of metallic quasi-dielectrics, (A)1338
—— and F. K. Harvey, structures for refracting sound waves, 5
Koenig, W., Landis and Gyr centralized control system, 1744
Koerner, L. F., high-accuracy stabilized v.f.o., 1464
Köhler, H., radiation characteristics for vertical aerials over uneven ground, 39; vibration meters with electrical indication, 185
—— with W. Endres, fluid dielectrics for u.h.f., 1706, (C)3071
Kohler, M., theory of magnetic resistance effect in metals, 2480
Kojan, J. S., and G. A. Isted, ionospheric storm warning service, 2321
Kompfner, R., operation of travelling-wave valves at low level, 3206
—— with D. K. C. MacDonald, quantum interaction of electron beams and h.f. fields, 603, (C)1658
König, H., M. Krondl and M. Landolt, introduction of Giorgi system of units, 1125, (C)2467
Kopfermann, H., with H. Jahn, theory of radial oscillations of electrons in electron accelerator, 2592
Koppelmann, F., capacitance bridge with mechanical rectifier, 944
Korn, G. A., stabilization of simultaneous-equation solvers, (D)1956
Korn, T. S., loudspeaker baffles, 2120; sound problems in halls with large reverberation times, 534; theory of intelligibility within rooms, 2900
Kornetzki, M., magnetic characteristics of coils with pot cores of powdered iron, 3073
Kornfeld, J., fundamentals for planning of beam radio links, 3161
Koros, L. L., speech inverter system for telephony, 2021
Koschel, H., reproduction of natural speech sounds, 1329
Koslow, B., application of statistics to acceptance specifications, (A)1559
Kosman, M. S., with R. E. Averbukh, dielectric properties of BaTiO$_3$, 2800
Kosten, C. W., with C. Zwikker, Sound-Absorbing Materials (B)2704
Kotter, F. R., with others, absolute measurement of resistance, 932
Krabbe, U., The Transductor Amplifier, (B)2757
Kramer, A. W., Industrial Electronics, (B)2318
Krasnushkin, P. E., application of normal-wave method to stratified medium, 975
—— and R. V. Khokhlov, spatial beating in coupled waveguides, 30
Kratz, H. R., with others, particle injection into accelerators, 1471
Kraus, A., high load transmission-line dummy aerials, 2577
Kraus, J. D., helical-aerial design, 555
—— with T. E. Tice, helical beam-aerials, 283
Krause, L., with others, design considerations in television transmitters, (A)1584
Krauss, H. L., and P. F. Ordung, wide-band power resistors, 2782
—— with others, behaviour of resistors at h.f., (A)1355
Krautkrämer, J., drift effects for rapid ionosphere-echo fluctuations, 3144
Kreer, J. G., with J. H. Bollman, application of thermistors in control networks, 1350
Kraft, W., dm-λ measurement of dielectric properties at 20°–80°C, 2569
Kreielsheimer, K., radiosonde for potential-gradient measurements, 1204
Kretzmann, R., industrial applications of gas-filled valves, 963
Kretzmer, E. R., interference characteristics of p.t.m. systems, 1770
Kriksunov, V. G., design of RC oscillators, 1379
Kroebel, W., frequency spectrometer, 406
—— with E. Knoop, ignition and discharge processes in gas triodes, 3212
Kröger, F. A., activation of ZnS by Na and Li, 109
—— and J. Dikhoff, trivalent cations in fluorescent ZnS, 2228
—— and W. Hoogenstraaten, fluorescence in Zn and Zn-Be silicates, 106
—— and N. W. Smit, formation of fluorescence centres in ZnS-Cu, 2229
—— J. E. Hellingman and N. W. Smit, fluorescence of ZnS-Cu, 1425
—— with W. Hoogenstraaten, fluorescence efficiency of willemite phosphors, 105
—— with N. W. Smit, luminescence of ZnS-Pb, 110
Krondl, M., with others, introduction of Giorgi system of units, 1125, (C)2467
Kronjäger, W., survey of German overseas radio service, 2393
Krug, K. A., Transients in Linear Electrical Systems, (B)1649
Krüger, M., oscillator output coupling for industrial heating, 1376
Krumhansl, J. A., and R. T. Beyer, Barkhausen noise and magnetic amplifiers, 298
Kruse, O. E., and R. B. Watson, a.f. phase meter, 1190
Kübler, E., special relativity theory, 82
Kuder, M. L., c.r.o. display of valve characteristics, 2288
Kuester, D. W., a.f. transformer for 0·2 c/s–20 kc/s, 2726
Kuhner, M., with A. Blanc-Lapierre, travelling-wave amplifiers, 2060
Kühnert, K., and M. Delattre, no-load characteristic of transductor, 299
—— with M. Delattre, transient regime in series transductor, 584
Kulinyi, R. A., military s.s.b. equipment development, (A)1511
Kummer, E., with others, dead time and nonlinearity of G-M-counter X-ray spectrometer, 181
Kuhn, K. S., application of bilinear transformations to output-stage tuning, 80
Kuper, J. B. H., desirable improvements in nucleonics instrumentation, (A)955
Kupferman, S., elimination of television interference in amateur 10-m transmitter, 2053
Küpfmüller, K., Die Systemtheorie der elektrischen Nachrichtenübertragung, (B)1010
Kurss, H., with others, equivalent circuits for slots in rectangular waveguides, (A)1338
Kurtze, G., with K. Feher, selective RC a.f. amplifier, 1643
Kussmann, A., and G. von Rittberg, magnetic properties of Pt-Fe alloys, 2788
—— with M. Auwärter, ferromagnetic Pt/Mn alloys, 2789
Kussy, W. F., temperature behaviour in electrically heated non-homogeneous bodies, 189
Kwartiroff A., with T. Kahan, pulse counter with scaling-down circuit, 831

L

Labeyrie, J., vacuum-tight sealing of glass and mica, 1437
Labin, E., eidophor method for theatre television, 2641; theory of synchronization by phase control, 1600
Lachenbruch, S. H., with L. L. Marton, electron-optical shadow method for e.s. and e.m. fields of small dimensions, 199, 967, 1211
—— with others, fringe fields of ferromagnetic domains, 1212
Lachner, F., colour television system with faithful reproduction, 3186; stereoscopic television, 1266
Lacy, L. Y., with W. R. Young, Jr, multipath echoes with 450-Mc/s car-radio transmissions, 1777
Lafferty, J. M., boride cathodes, 3207
Laffineur, M., solar and galactic r.f. radiation, 614
LaGrone, A. H., and A. W. Straiton, optimum aerial for reception of 3·2-cm signals over 27-mile desert path, 731
—— with A. W. Straiton, angular separation of direct and reflected 3·2-cm waves, 2016; modified refractive index over Gulf of Mexico deduced from radio data, 2773
—— with others, microwave signal strength, phase, and index of refraction, 1483
Laird, E. R., and K. Ferguson, dielectric properties of animal tissues at m and cm λ, 1197
Lalande, M. A., with A. Fromageot, band-pass crystal filters in lattice structures, 842; template method for the design of filters, 2998
Lallemand, A., design of electron-multiplier tubes, 2663
Lamb, J. J., and J. A. Brustman, polycathode glow tube for counting, 266
Lambert, R. F., with H. E. Hartig, attenuation of transverse acoustic waves in a slotted rectangular waveguide, 1057
Lamberts, K., and L. Pungs, wide-band m- and dm-wave aerials, 2426
Lamson, H. W., decade inductor, 81
Landecker, K., with V. A. Bailey, electro-magneto-ionic waves, 2768
Lander, G., with O. Schäfer, electrical device for calculation of product integrals, 1734
Landolt, M., dimensions of physical quantities, 2468
—— with others, introduction of Giorgi system of units, 1125, (C)2467
Landon, V. D., ferrite-cored coils as converters, amplifiers and oscillators, 51; network bisection theorem, 54
Landsberg, P. T., image force in rectifiers, 465
—— with E. Billig, characteristics of barrier-layer rectifiers, 1528
Langmuir, D. B., automatic plotter for electron trajectories, 1718
Langton, L. L., Radio-Frequency Heating Equipment, (B)434
Lantieri, J., matrix method for network calculations, 1876
Laplume, J., electron lenses in relativistic mechanics, 1478; maximum transmission capacity of a channel in presence of noise, 2338
Lapostolle, P., interaction phenomena in travelling-wave valves, 2061; Si-crystal detectors, theory and experiment, 788; theory of travelling-wave amplifier, 1809
Lappin, L. S., and J. R. Bennett, 1-kW u.h.f. television transmitter Type TTU-1A, 2659
Larach, S., poisoning of luminescence of ZnS-Ag, 2793
Lark-Horovitz, K., conductivity in semiconductors, 666
—— and others, nucleon-bombarded silicon, (A)1938
—— with J. H. Crawford, Jr, fast neutron bombardment effects in Ge, 2196; thermal equilibrium in neutron-irradiated Ge, 3024
—— with V. A. Johnson, Hall-effect formulae for impurity semiconductors, 2491
—— with others, Ge semiconductors produced by neutron bombardment, 2195; structure of PbS, PbSe and PbTe films, (A)2537
Larsson, H., use of radar in ice-breaker service, 842
LaSalle, J., relaxation oscillations, 2261
Lash, J. F., contact-modulated amplifier, 591
Latson, F. W., with W. C. Johnson, analysis of transients and feedback in magnetic amplifiers, 1873
Laufer, A. R., G-M counters, electric field in, 1986, time lags in, 1985
Laurent, T., calculation of transients in electrical filters, 2154
Lauter, E. A., propagation of 1250-m waves during occurrence of Mögel-Dellinger effect, 716
—— and K. Sprenger, sky-wave observations during auroral displays in 1947, 728
—— with G. Falckenberg, ionization of stratosphere, 626
Laver, F. J. M., quartz resonators as frequency substandards, 1453, (D)2829
Lavet, M., synchronization of clocks by means of time signals, 1446
Lawson, A. W., with J. B. Garrison, absolute noise thermometer, 947
Lawson, J. D., H. E. Walford and J. H. Aram, extraction of electron beam from 30-MeV synchrotron, 2857
—— with P. M. Woodward, gain of aerial systems, (D)2135
Lawson, J. L., with others, particle injection into accelerators, 1471
Lax, B., e.m. wave propagation in magneto-ionic media, (A)2609
Learned, V., with C. Veronda, recent development in high-power klystron amplifiers, (A)1554
Leas, J. W., analysis of course errors in v.h.f. omnidirectional radio range, (A)1416
Lebacqz, J. V., and others, r.f. detection with CbN superconductor, 223
Lebenbaum, M. T., design factors for low-noise input circuits, 1504, (C)2018
—— and P. D. Strum, low-noise-figure microwave receiver design, (A)1501
Le Bot, J., spark transmitter for damped cm waves, 1021
LeCaine, H., with others, electron cyclotron, 1472
Lechenne, M., radio receiver and gramophone pickup connection, 3147
Leclère-Courbe, J., radio equipment on s.s. *Ile de France*, 1000
Le Corbeiller, P., Matrix Analysis of Electric Networks, (B)1892
Ledig, P. G., Cheltenham *K*-indices: April–June 1949, 821
Lee, H., transformer performance and measurements, (A)1355
Lee, R. W., PbS photoconductive cells in sound reproducers, 1027
Lee, Y. W., and C. A. Stutt, statistical prediction of noise, 2755
—— and J. B. Wiesner, correlation functions and communication applications, 2282
—— with J. B. Wiesner, determination of system functions by correlation, (A)[illegible]

Leemann, A., r.f. heating of small parts, 1994
Leferson, J., pulse equipment for display of valve characteristics, 2576
Legros, J., and C. Azéma, measurements on magnetrons, 507
Lehany, F. J., and D. E. Yabsley, solar radiation at 200, 600 and 1200 Mc/s, 616
Lehfeldt, W., u.s.w. propagation, 962
Lehman, G. W., with H. M. James, potential fluctuations in semiconductors, (A)2476
Lehmann, G., amplification of very-low-frequency currents, 1049; maximum accuracy of servomechanisms, 2634
Lehmann, J., harmonic analyser and synthesiser, 158
Lehmann, R., with P. Chavasse, background noise and use of white noise in acoustics, 2399; study of acoustics of telephone bells, 1325; telephony and noise in aircraft, 1328
—— with others, harmonic distortion of sound receivers, 799; watch, as noise source for audiometry, 1064
Lehner, H., electroacoustic frequency-response recorder, 1449
Leifer, M., and N. Marchand, application of communication theory to periodic radio systems, (A)1511
Leitner, A., and R. D. Spence, effect of ground plane on radiation from λ/4 dipole, (A)2423; oblate spheroidal wave functions, 2259
Lejay, P., and D. Lepechinsky, field strength as function of distance from transmitter, 1229
Lengyel, B. A., Michelson-type interferometer for microwave measurements, 403
Lennartz, A., tone control in sound recording, 1853
Lennartz, H., with H. Boucke, distortion-measurement apparatus, 2571; sensitive d.c. amplifier, 1889
LePage, W. R., C. S. Roys and S. Seely, radiation from circular current sheets, (A)1338
Lepechinsky, D., M-mode propagation possibilities, 1230
—— with P. Lejay, field strength as function of distance from transmitter, 1229
Lerbs, A., with others, magnetron-type travelling-wave amplifier, 2064
Leroy, R., synthesis of quadripoles, (D)574, 1616
Leslie, F. M., output formulae for magnetostriction ultrasonic oscillators 2684; transmission-line equivalent for quartz crystal, 2162
Lester, G. H., WWVH standard-frequency transmitting station, 747
Levenson, M. E., harmonic and subharmonic oscillations in nonlinear systems, 847
Leverenz, H. W., Introduction to the Luminescence of Solids, (B)1946
Levine, A. M., with D. D. Grieg, multiplex microwave radio relay, (A)1511
—— with A. G. Kandoian, u.h.f. multiplex broadcasting system, 996
Levine, D., radar volume-scanning with conical beams, 1691; response of RC circuits to multiple pulses, 64
Levine, H., variational principles in acoustic diffraction theory, 1052
—— and J. Schwinger, diffraction by aperture in infinite plane screen, 83, (D)31, 1297
LeVine, H. D., H. J. DiGiovanni and M. R. Coe, G-M counter for civilian-defence use, 2861
Levinson, N., B. Bogert and R. M. Redheffer, separation of variables in Laplace's equation, 2260
Levy, J. L., with others, design of racetrack synchrotron, (A)2597
Levy, M. M., design of pulse-time multichannel radio systems, 462
Lewin, L., reflection cancellation in waveguides, 2128
—— J. J. Muller and R. Basard, phase distortion in feeders, 2125
Lewis, E. J. G., Radio Servicing Equipment, (B)2299
Lewis, I. A. D., Miller circuit as low-speed integrator, 1111, (C)1631
—— and J. F. Raffle, scale-of-ten counting unit, 830
Lewis, L. G., J. G. Robinson and J. Toll, linear preamplifier for use with long coaxial cable, 3013
Libois L. J., pulse multiplex equipment for 24-channel telephony, 998, (C)1768
Libsch, J. F., and A. E. Powers, rapid tempering by induction heating, 3113
Lichnerowicz, A., Éléments de Calcul Tensoriel, (B)2269
Lichtenstein, R. M., radiation dosage measurement with alkali-halide crystals, (A)955
Lichtman, S. W., h.v. regulation by means of corona discharge, (A)1526
Licklider, J. C. R., with G. A. Miller, intelligibility of interrupted speech, 1843
Liddel, U., news of the nucleus, (A)1392
Liebmann, G., ray tracing for electron lenses, 966; resistance-network analogue for solution of partial differential equations, 1954
Liénard, A., attraction between parallel currents, 1396
Lignon, J., phase inverter for push-pull amplifier, 1387
Lilly, J. C., 25-channel recorder for mapping brain-voltage gradients, (A)955
Lindenhovius, H. J., G. Arbelet, and J. C. van der Breggen, millivoltmeter for the range 1 kc/s–30 Mc/s, 2285
Lindsay, D. G., dual-diversity frequency-shift reception, 1761
Lindsay, R. B., with A. E. Bakanowski, crystal pickup for ultrasonic measurements on rods, 1061
Lines, A. W., mm waves, survey, 315
—— G. R. Nicoll and A. M. Woodward, properties of waveguides with periodic structure, 2706
—— with others, discrepancies in measurements of microwave power, 1191
Linfoot, E. H., aberration of Schmidt camera, 347
—— and P. A. Wayman, aberrations of field-flattened Schmidt camera, 1655
—— and E. Wolf, corrector plates for Schmidt cameras, 346
Lingel, F. J., Ge diodes for u.h.f. television, 1307
Linke, J. M., synthesis of general insertion attenuation functions, 2151
Linton, R. L., Jr, power meter for communication frequencies, 409
Liot, L., coaxial oscillator for dm λ, 850; Technique des Ondes Très Courtes et Ultra-Courtes: Tome I—Circuits Oscillants et Tubes à Vide, (B)3017; u.h.f. oscillator using disk-seal triode 2C40, 1033; 30-W disk-seal triode Type T30H, 783
Little, E. F., preventing fungus damage, 664
Livingston, M. S., particle accelerators, (A)1467
—— and others, 3-kMeV proton accelerator, 1738
Liwschitz-Garik, M., L. J. Smith and E. Weber, problem of the magnetic amplifier, 2729
Lliboutry, L., magnetic after-effect, laws relating to, 1660, revealed by a blow, 2230
Lloyd, L. S., international standard musical pitch, 527
Lob, C. G., and D. F. Holshouser, radial-beam v.m. microwave valve, 2947
Locanthi, B. N., with others, nonlinear devices in analogue computer, (A)918
Loeb, J., introduction to signal and information theories, 3155; linear and nonlinear mechanics, 1393
—— J. R. Dutilh and A. Jeudon, radio synchro-motor, 1258
—— M. Jezo and C. Lombard, voltage discriminator for d.f., 895
—— with Y. Rocard, servomechanisms and telecontrol, 1253
Lofgren, E. J., proton synchrotron, 2309
Lombard, C., with others, voltage discriminator for d.f., 895
London, A., determination of reverberant sound absorption coefficients from acoustic impedance measurements, 1846; transmission of sound through double walls, 1845
Loosjes, R., and H. J. Vink, oxide-coated cathodes, conduction processes in, 2934, electron emission and conduction mechanism of, 491, 3208, potential distribution during pulses of great current density, 1302
—— H. J. Vink and C. G. J. Jansen, potential distribution in pulsed oxide cathodes, [illegible]
Lord, H. W., with W. C. White, reciprocator, 66
Loughlin, B. D., theory of a.m. rejection in the ratio detector, (A)1501
Louw, J. D., and S. M. Naude, spurious counts in G-M counters, 701
Love, W. F., with R. F. Blunt, dielectric properties of BaTiO$_3$ at low temperatures, 1702
Lovell, A. C. B., meteor ionization in upper atmosphere, (A)1410; radio investigation of meteors, (A)356
Lower, J. W., a.f.c. for power oscillators, 705
Lowry, E. F., E. L. Mager and H. H. Homer, study of oxide cathodes for fluorescent lamps, (A)2055
de Luca, L., time constants for study of linear lumped-constant circuits, 1607
Lucas, R., radiation pressure of spherical sound waves, 2401
Luck, D. G. C., Frequency Modulated Radar, (B)1921
Lüdi, F., turbator, 2945, in radio relay equipment, 3006
Lugeon, J., P. Ackermann and M. Bohnenblust, Swiss radiosonde, 949
Lukoff, H., with others, c.r. tube e.s. memory system, 2005
Lund, C. O., broad-band transition from coaxial line to helix, 1612
Lundburg, F. J., and F. X. Bucher, aerial for v.h.f. radio ranges and d.f., (A)1338
Lundry, W. R., attenuation and delay equalizers for coaxial lines, (A)1619
Lur'e, O. B., transients in wide-band feedback amplifiers, 78
Lutkin, F. E., and J. Chisholm, storm location by radar in S.E. Asia, 362
Lutsch, A., usefulness of s.s.b. methods for f.m. transmissions, 743
Lutz, B. C., with W. A. Budlong, automatically synchronized electronic switch, 1603
Lutz, S. G., and G. Rand, ultrasonic operation of lantern-slide changer 2846
Lutzker, L., quality control of television receivers, 2100; statistical methods in research and development, (A)1559
Lyddiard, J. A., and J. W. Osselton, display equipment for electrical transients, 1205
Lynch, A. C., measurement of equivalent-circuit constants of piezoelectric crystals, 1975
—— with others, piezoelectric crystals for filters, 116
Lynch, R. T., with H. E. Kern, diode studies of oxide-coated cathodes, (A)2079
—— with others, thermionic properties of dense oxide cathodes, (A)2073
Lyons, H., u.h.f. frequency dividers, 1113
Lytel, A., television camera-tube design, 1780
Lytle, C. W., f.m. television tuner, 2884
Lyutov, S. A., design of h.f. LC filters, 845

M

MacDonald, A. D., and S. C. Brown, electron diffusion in spherical cavity, 2191
—— with R. H. Bolt, theory of speech masking by reverberation, 532
MacDonald, D. K. C., and R. Kompfner, quantum interaction of electron beams and h.f. fields, 608, (C)1658
—— with R. Fürth, current in retarding-field diodes, 2092
MacDowell, G. P., with G. R. Hilst, radar measurements of initial growth of thunderstorm rain cells, 2220
Macfarlane, G. G., energy spectrum of nearly periodic pulses, 217
—— and H. G. Hay, wave propagation in slipping stream of electrons, 2375
Macgeorge, W. D., differential transformer and applications, 695
MacGregor-Morris, J. T., life and work of Ambrose Fleming, 1043
Mackey, D., and E. J. Sass, design of printed-circuit television tuner, (A)1534
Macklin, R. L., with others, scintillation-type alpha-particle detector, 2858
Macnee, A. B., electronic differential analyser, 386
Maddock, A. J., co-operative research at B.S.I.R.A., (A)1998
Madsen, E. C., with others, propagation of e.m. waves through ground, 981
van der Maesen, F., dielectric constant of benzene, 125
—— with J. Clay, dielectric constant of gases, 128
Mager, E. L., with others, study of oxide cathodes for fluorescent lamps, (A)2055
Magnan, C., proton microscope, ion optics and mass spectrography, (A)1475
Magne, P., transmission-line discriminator, 2331
Magnus, W., with F. Oberhettinger, Anwendung der elliptischen Funktionen in Physik und Technik, (B)2820
Makar, R., with others, electrolyte tank for network response measurements, (A)1360
Malan, D. J., and B. F. J. Schonland, e.s. fluxmeter with short response time, 2881
Malatesta, S., analysis of cathode followers, 1386
Malmfors, K. G., unstable oscillations in an electron gas, 2764
Maloof, M., with others, single-pulse voltmeter, 939
Malter, L., and M. R. Boyd, thyratron grid emission and trigger-grid thyratron, (A)1554
—— and G. R. Brewer, microwave Q-measurements in presence of series losses, 400
—— and E. O. Johnson, grid resistance and recovery time of thyratrons, 2675
—— with E. O. Johnson, grid-potential variations and recovery time of thyratrons, 2676
Malvano, R., microwave attenuators, 600
Mandel, H., military storage batteries, 2904
Mandel, P., high-definition television receivers, 1018, (C)1788; large-screen television projector, 764
Mandl, F., with J. S. de Wet, asymptotic distribution of eigenvalues, 1133
Manley, J. C., and E. F. Buckley, neon-diode ring counter, 832
Mannevy-Tassy, G., temperature variation of resistance of ferromagnetic materials, 1696
Manning, L. A., O. G. Villard, Jr, and A. M. Peterson, meteor-trail-echo study of winds in upper atmosphere, 3052
Mansberg, H. P., with C. Berkley, technique for high-speed c.r.o. oscillography, 759
Mansur, L. C., single-pulse recording of radar displays, 1710
Manuele, J., importance of practical design and specifications for effective production and high quality, (A)1534
Maple E., W. A. Bowen and S. F. Singer, geomagnetic field strength at great altitudes, 2497
Marais, A., with I. Epelboim, macroscopic magnetic texture of permalloy tape, 906
Marchand, N., with S. A. Briller, differential vectorcardiograph, (A)1467
—— with M. Leifer, application of communication theory to periodic radio systems, (A)1511
Marcus, E. J., and M. V. Marcus, diamond as gramophone stylus material 2702
Marcus, M. V., with E. J. Marcus, diamond as gramophone stylus material, 2702
Marcuvitz, N., with others, equivalent circuits for slots in rectangular waveguides, (A)1338
Marfoure, S., with others, thermal variation of coercive field of powdered cobalt, 2235
Marié, P., new type of magnetron amplifier, 1829
Marique, J., monitoring of radio transmissions for naval and aviation purposes, 166
Marmor, S., receivers with crystal detectors, 3150
Maron, M., d.c. amplifier techniques in oscillography, 2838
Maroni, C., with S. C. Brown, plateau slopes in self-quenching G-M counters, 1984
Marrison, W. A., development of quartz clock, 135
Marsden, E., Rutherford Memorial lecture, 2102
Marsh, J. A., current distribution in helical aerial, (A)1338
Marshall, B. O., Jr, electronic isograph for roots of polynomials, 1949
Marshall, C. W., radio and television interference from h.v. systems, 3152
Marshall, J., high-fidelity audio amplifier, 1641; low-noise front end for f.m. tuner, 2618
Marshall, J. G., impedance matching for 2-band aerials, 34, 1339
Marshall, J. N., with others, pictorial display in aircraft navigation and landing, 1694
Martin, A. E., specification for visual quality of c.r. tube screens, (A)1454
Martin, A. V. J., TV5 de luxe, 3190
Martin, F. W., stresses in cylindrical glass/metal seals, 2806
Martin, G., calculation of artificial delay lines, 2130
Martin, J., with H. Jacobs, effect of cathode temperature in glow discharges, 2763
Martin, J. F., with J. H. Crede, magnetic properties of oriented 50% Ni/Fe alloy, 372
Martinson, O., and others, rise times of photomultiplier voltage pulses, 2664
Marton, L., Advances in Electronics, Vol. 2, (B)2006; electrons vs photons: a comparison of microscopes, 2601
—— and S. H. Lachenbruch, electron-optical shadow method for e.s. and e.m. fields of small dimensions, 199, 967, 1211
—— and D. L. Reverdin, electron optical properties of space-charge clouds, 3118; stroboscopic observation of time variable fields, 2584
—— and others, fringe fields of ferromagnetic domains, 1212
Martyn, D. F., cellular atmospheric waves in ionosphere and troposphere, 1680
Masket, A. V., with W. M. Sessler, high-speed electronic scaler circuit, 2587
Mason, D. E., with G. F. J. Garlick, luminescence of ZnS·Sn phosphors, 654
Mason, S. J., generalization of Nyquist's stability criteria, (D)294
Mason, W. P., optical properties of crystals expressed in tensor form, 2943; Piezoelectric Crystals and their Application to Ultrasonics, (B)2807
Massa, F., vibration measurement, 20 c/s–20 kc/s, 706
Matare, H. F., diode as u.h.f. mixer valve, 2505; sensitivity of mixer stages for dm and cm waves, 855
Mather, J. R., radar investigation of dimensions of precipitation areas, 1685
Mather, N. W., analysis of triple-tuned coupled circuits, 2745
Mathes, R. C., A. C. Norwine and K. H. Davis, c.r. sound spectroscope, 9
Matheson, R. M., and L. S. Nergaard, pulsed emission of oxide-coated cathodes, (A)2080
Matschinski, M., measurement of current with ammeter of apparent resistance zero, 2560
Matthes, R., frequency stability and parasitic oscillations in l.f. oscillator, 1630
Matthias, B., ferroelectric crystals, 2794
—— and A. von Hippel, domain structure and dielectric response of BaTiO$_3$ single crystals, 2250
Matthias, B. T., with others, Ni ferrite, ferromagnetic resonance of, (A)2485, properties of single crystals, (A)2529
Mattler, J., effect of temperature on extinction of luminescence of sulphides by electric fields, 1184
Maugard, G., with C. Béguin, location of line faults by pulse methods, 3091
Maurice, D., G. F. Newell and J. G. Spencer, electrical noise measurement, 989
Mawardi, O. K., propagation of sound in narrow conduits, 2
—— with C. A. Ewaskio, electroacoustic phase shift in loudspeakers, 2898
May, J. C., variable-pulse-width generator, 853
Mayer, W., 75-W variable-frequency driver unit, 475
Maze, R., glass-walled counters with external cathode, 699
Mazel', K. B., voltage stabilizer with parallel regulating valve, 1530
McAdam, W., with others, stabilization of wide-band d.c. amplifier, (A)598
McCaa, D. G., with others, increase of Q and reduction of ageing for quartz crystal blanks, 375
McCaig, M., magnetostriction of anisotropic permanent-magnet alloys, 129; preferred domain orientation in permanent-magnet alloys, 2241
McCann, G. D., C. H. Wilts and B. N. Locanthi, nonlinear devices in analogue computer, (A)918
McClure, F. N., with others, magnetic-amplifier studies on analogue computer, 2731
McCouch, G. P., with P. S. Jastram, video-frequency noise-spectrum analyser, 165
McCoy, D. O., with D. B. Harris, product phase modulation and demodulation, (A)1511
McCoy, J. E., and H. P. Warner, theatre television, 249
McCoy, R., and D. Herr, modern methods of servo synthesis, (A)1355
McCreary, H. J., magnetic-cross valve and its use for generation of subharmonics, 2727
McDonald, D., analogue computers for servo problems, 1715
McElwee, E. M., statistics of life expectancy of valves, (A)1559, 2104
McFall, R. W., with S. M. Kaplan, statistical properties of noise applied to radar range performance, (A)1416
McFee, R., improvement of differential-amplifier rejection ratios, 3006
McFee, R. H., properties of photosensitive PbS films, (A)2538
McGee, J. D., distant electric vision, 761, 2637
McGregor, R. B., television reception below line of sight, 257
McGuire, W. S., wide-band v.h.f. radio relay system, 745, 3170
McIntosh, F. H., and G. J. Gow, new 50-W a.f. amplifier circuit, 592
McKay, K. G., electron-bombardment conductivity of diamond, 1672; Ge-crystal counter, 1987
McKeag, A. H., with H. P. Rooksby, investigation of phosphors by X-rays, 2227
McKenna, M. P., with D. M. Tombs, amplifier with negative-resistance load, 2170
McKinney, C. M., with others, radiation patterns of dielectric rods, (A)1367
McKown, C. S., and W. P. Caywood, Jr, synchro-cyclotron field regulator, (A)1467
McLaughlin, J. L. A., folded-sideband modulation, 1590
McLoughlin, R. P., and G. N. Guastavino, Iupam—ultrasonoscope locator for medical applications, 1196
McLusky, G. J. R., with S. E. Moody, secondary-emission valves in wide-band amplifiers, 886
McMullan, D., reduction of effects of fading and interference in television, 1278, 2052
McNally, J. O., life tests of oxide-coated cathodes, (A)2063
McNeil, R. B., remote control by a.f. discrimination, 1215
McNicol, R. W. E., fading of m.f. and h.f. waves, 443
McNish, A. G., radio reflections from meteor trails, (A)613
—— and T. N. Gautier, lunar ionospheric variations at low-latitude stations, 635
McPhee, K. H., with H. W. Soderstrom, vacuum metal/ceramic high-temperature applications, (A)1554
McProud, C. G., sound reproduction, needle-scratch suppressor, 1117, 1289
McSkimin, H. J., ultrasonic techniques for elastic-constant measurements, 2844
Meacham, L. A., and S. E. Michaels, square-pulse response of Ge transistors and varistors, 1817
Mead, S. N., and G. E. Day, synchronous units for telemetry and telecontrol, 2353
Meakins, R. J., corrosion of Cu wires in contact with insulating materials, 3056; insulation improvement for glass and ceramics by use of quaternary NH$_4$ compounds, 3066
—— J. W. Mulley and V. R. Churchward, insulation improvement for glass and ceramics by use of organosilicon compounds, 3066
Means, W. J., and T. Slonczewski, automatic calibration of oscillator scales, 2825
Medhurst, R. G., and S. D. Pool, v.h.f. correction factors for slotted lines, 2836
Medina, L., measurement of no-load losses of small 50-c/s transformers, 1967
Mednick, I. R., with I. Gottlieb, crystal control for Citizens' band, 2994
Medvedieff, S., with others, magnetic properties of a Co ferrite, 1168
Meek, J. H., sporadic ionization at high latitudes, (A)725, 1224
Meeker, W. F., loudspeaker housings, (A)1819
—— F. H. Slaymaker and L. E. Merrill, acoustical impedance of loudspeaker housings, 1851
van der Meer, S., with W. Steckelmacher, automatic control of thermionic emission, 2849
Megla, G., problems of dm-wave links, 1772; tank circuits as dm-λ resonators, 65
Meinke, H. H., broad-band problem in dm-wave technique, 1618; components for v.h.f., 338; field in nonuniform circular waveguides, 548
—— with A. Egger, resistance measurement at h.f. by means of lossless quadripoles, 2562
Meisinger, O., calculation of three-point alignment circuit in superheterodyne receivers, 3148
Meixner, J., edge condition in theory of diffraction of e.m. waves, 2478
—— and W. Andrejewski, diffraction of e.m. waves by circular disk or aperture, 2767
—— and U. Fritze, sound field near piston membrane, 1052
Mellen, G. L., gas-flow speedometer, 1195; measurement of pressures below 10 mm Hg, 898
Meltzer, B., electron flow under space-charge conditions, 871; noise in current-carrying resistors, 2141; 2-cavity klystron, 1558
Melvin, M. P., spiral inductuners for television receivers, 2818
Meneley, C. A., and C. D. Morrill, linear electronic analogue computer design, [illegible]
Menzel, D. H., origin of sunspots, 2207
—— and D. J. Crowley, point sources of radio noise, 1406
Merhaut, J., design of horn loudspeakers, 2408; underground loudspeakers 19
Merian, P., with A. Kaufmann, galvanometer theory, 2283
Merrill, L. L., with others, acoustical impedance of loudspeaker housings 1851
Merriman, J. H. H., and R. W. White, f.m. v.h.f. multichannel R/T, (D)1516
Merritt, F. R., with others, ferromagnetic resonance, in Mn ferrite, 2484, of Ni ferrite, (A)2485
Mertz, P., television random noise, 1276
—— A. D. Fowler and H. N. Christopher, quality rating of television images, (A)1584
Merz, W. J., properties of BaTiO$_3$ single domain crystals, 1704
Mesnard, G., polarization of electrodes in electrophoresis and electrolysis of thoria and thorium nitrate, 3059
—— and R. Uzan, preparation of thoria cathodes by cataphoresis, [illegible]
Messerschmidt, W., s.w. propagation over great distances, 3138
[illegible], G. A., with M. Mokhtar, acoustics of conical pipes, 524
[illegible], A. A., voltages on guy-wire insulators for tower aerials, 1340
Metson, G. H., vacuum factor of oxide-cathode valves, 1813
Metzler, E., broadcasting conferences in Copenhagen and Mexico, [illegible]
Mey, J., high-quality a.f. amplifier, 1119
Meyer, C. F., with R. C. Herman, rise in brightness of infrared-sensitive phosphors, 368
Meyer, E., and H. Severin, demonstrations with cm waves, 1044
Meyer, H. F., with J. Hessel, Signal Corps h.f. radio communication research and development, (A)1511

—— with others, comparison of modulation methods for R/T, (A)1511
Meyerhans, C., with E. Preiswerk, ethoxyline resins, araldite, 126
Michaelis, M., and R. O. Jenkins, portable G-M counter, 1200
Michaels, S. E., with L. A. Meacham, square-pulse response of Ge transistors and varistors, 1817
Michels, W. C., and E. D. Redding, synchronous detector, 222
—— and S. Wilford, emissivity and resistivity of Ti, 1177
Middleton, D., effect of video filter on detection of pulsed signals in noise, 3151; spectrum of f.m. waves after reception in random noise, 2335
Middleton, E. J., magnetic recording and its use in the S.A.B.C., 1854
Migulin, V. V., and T. N. Yastrebtsova, transitron relaxation oscillator, 1380
Miles, J. W., diffraction of e.m. waves by plane screen, 202, (C)2320; diffraction of plane wave by grating, 2179; integral equations in diffraction theory, 1654
Millán, A., transformation of lumped-constant 2-pole network to dissipative lossless transmission line, 2147
Millar, J. Z., and L. A. Byam, Jr, microwave propagation test, (A)1482, 2616
—— and W. B. Sullinger, New York/Philadelphia microwave television relay, 1523
Millar, N. P., expanded-scale a.c. voltmeter, (A)687
Miller, B. L., optimum parameters for TM_{010} cylindrical resonators for particle accelerators, (A)2590
Miller, C. F., and F. G. Whelan, measurement of dielectric constant and dissipation factor, (A)2277
Miller, C. H., RC-amplifier filters, 859
Miller, G. A., and J. C. R. Licklider, intelligibility of interrupted speech, 1843
Miller, H. P., Jr, l.f. radiotelegraph transmitter for arctic use, 2368
Miller, J. C. P., and Z. Mursi, solution of $y''-xy = f(x)$, 2556
Miller, J. M., Jr, a.f. amplifier with combined positive and negative feedback, 1390; cathode neutralization of video amplifiers, (C)339
Miller, K. S., and R. J. Schwarz, analysis of a sampling servomechanism, 2029
Miller, M., with A. Gaponov-Grekhov, excitation of circular waveguide by ring aerial, 1075
Miller, M. L., design of equipment using subminiature components, 1872
Miller, P. H., Jr, noise in semiconducting contacts, (A)240
—— and B. J. Rothlein, work function of contaminated metal surfaces, (A)1928
Miller, R. E., Maintenance Manual of Electronic Control, (B)246
Miller, T., broad-band bolometer cavity for λ 10 cm, 167; magnetically controlled waveguide attenuators, 337
Miller, W. E., Television Explained, (B)2367
Millikan, R. A., Einstein on his 70th birthday, 1041
Millington, G., computation of great-circle bearings and distances, 2510; reflection coefficient of linearly graded layer, 715; scattering of radio waves from region E, (A)1488
—— and G. A. Isted, ground-wave propagation over land/sea boundary, 2372
Milne, R., c.r. beam-switching circuit, 1091
Milne, W. E., numerical integration of differential equations, 1712; Numerical Calculus, (B)2822
Milner, P. M., wide-range f.m. oscillator, 1980
Milnes, A. G., magnetic amplifiers, (D)45, new theory of (A)1599
Milosevic, M., test chamber for loudspeakers and microphones, 1326
Milward, H. K., and R. W. Hallows, limiter discriminator *vs* ratio detector, 225
Ming, Nai-Ta, quadripoles with prescribed frequency dependence, 572; Wilhelm Cauer, 2105
Ming-Yi Wei. See Wei, Ming-Yi.
Minnett, H. C., with J. H. Piddington, 24-kMc/s radiation from the moon, 612
Minorsky, N., energy fluctuations in van der Pol oscillator, 68
Mintzer, D., transient sounds in rooms, 2405
Mitchell, R. M., cathode-follower output stage, 1115
Mitra, S. N., fading of single downcoming wave from ionosphere, 442; radio method of measuring ionospheric winds, 96
Mitsui, T., with J. Furuichi, domain structure of Rochelle salt, 3062
Mittell, B. E. G., disk-recording standards, 1334
Mittelmann, E., and V. J. Cushing, electronic flowmeter and applications, (A)1467
Moch, R., servomechanisms and modern physics, 235
Mode, D. E., spurious modes in coaxial transmission-line filters, 1366
—— with J. J. Karakash, coupled-transmission-line microwave band-pass filter, 1368
Moeller, —, and — Wolff, Leitfaden der Elektrotechnik. Vol. 1: Grundlagen der Elektrotechnik, (B)2393
Moir, J., television in Great Britain, 3181; transients and loudspeaker damping, 1852
Mokhtar, M., and G. A. Messib, acoustics of conical pipes, 524
Moles, A., intelligibility ratio as criterion of acoustic quality of hall, 1831; practical applications of acoustic measurements on receiver loudspeakers, 2858
Moline, J., recent developments of the multivibrator, 1886; transitron effect and applications, 586; transitron integrator and relaxation oscillator, 852
Moll, P., rectifier ring-modulators for multichannel telephony, 1025
—— with H. Dumas, terminal equipment for French P.T.T. 600-channel carrier-current telephony circuit, 2022
Möller, H. G., theory of magnetron Barkhausen oscillations, 67
Molloy, E., with others, Outline of Radio, Television and Radar, (B)2954
Mongault, A., mechanical rectifiers, 2636
Montalenti, G., with G. Bonfiglioli, generalized-impedance method applied to e.m. screening, 3033
Montgomery, C. G., with H. Saltzmann, velocity of propagation of discharge in G-M counters, 2863
—— with D. Willard, measurement of spurious counts in G-M counters, 2862
Montgomery, G. F., i.f. gain stabilization by inverse feedback, 2461
Moody, N. F., design of electrical counters, (A)955
—— and G. J. R. McLusky, secondary-emission valves in wide-band amplifiers, 336
Mooers, H. T., l.f. noise in transistors, 2938
Moore, A. D., field plotting by fluid flow, 154
Moore, B. L., pentode counting or control ring, 2145
Moore, G. E., and H. W. Allison, thermionic emission of thin oxide films, 1165
—— with H. W. Allison, use of radioactive Sr in thermionic experiments, (A)1906
Moore, J. W., square-wave generator for biological studies, 1887
Moore, R. P., with others, counter circuits using transistors, 1992
Moore, T. M., German missile accelerometers, 753
Moorhouse, C. E., classes of circle diagrams, 2434
Morgan, F. H., refractory thermocouples and emissivity determinations, (A)1935
Morgan, F. H., with W. E. Danforth, electrical resistance, of thoria, 2539, of sintered thoria, (A)1934
Morgan, J. M., with R. C. Webb, industrial television system, (A)1467, 2350
Morgan, M. G., modulator producing 10^6 0·1-μs pulses/sec, (C)69
Morgan, S. P., Jr, mode conversion losses in nearly cylindrical waveguides, 1862
Morgulis, H. D., P. G. Borzyak and B. I. Dyatlovitskaya, properties of Sb-Cs cathodes, 1800
Morita, T., current distribution on transmitting and receiving aerials, 2976
Morrill, C. D., with C. A. Meneley, linear electronic analogue-computer design, 2809
Morrill, W., growth of oriented crystals and their effect on magnetic properties, 2769
Morrison, L. W., Jr, television terminal equipment for coaxial systems, 1967
Mortensen, T. W., Schlieren apparatus with multi-slit gratings, 1563
Mortley, W. S., television interference from incandescent lamps, 3051
Morton, G. A., photomultipliers for scintillation counters, 1196
Morton, P. L., compact magnetic storage drum, (A)1441
—— with D. R. Brown, University of California digital computer, (A)1441
Moses, H. E., and Ta-You Wu, distribution of O and O_2 in the upper atmosphere, (A)1912
Moses, S., and R. K. Witt, ultrasonic methods for adhesion measurement, 176
Mourier, J., and J. L. Steinberg, output voltage fluctuations in radio-noise receiver, 1230
Moss, H., Cathode-Ray Tube Traces, (B)2298
—— L. Woodbridge and M. Webb, dimensional tolerances in c.r. tube guns, 2941
Moss, T. S., photoconductivity of PbS, 369
—— with A. F. Gibson, photoconductivity of Bi_2S_3 and Bi_2Te_3, 1424
Mostovetch, N., and B. Vodar, resistance of thin metal layers at low temperatures, 1701
—— with B. Vodar, variation of resistance of thin metal films with applied potential, 2535
Mott, N. F., semiconductors and rectifiers, 118
Moullin, E. B., Radio Aerials, (B)1089
Moussiegt, J., relaxation oscillations in glow discharge tubes, 351
Moxon, L. A., measurement of noise figure and conversion loss in microwave receivers, 677; Recent Advances in Radio Receivers, (B)2020
Moyer, E. E., and M. E. Cummings, control requirements for d.c. adjustable-voltage drives, 704
Muckenhoupt, C. F., temperature and current distribution in cylinders, 350
Mueller, C. W., receiving valves using secondary-electron emission, 1814
Mulders, C. E., ultrasonic absorption in liquids, 1324
van Mulders, J., modulation of reflex klystron, 2370
Mulert, T., with others, television developments by Fernseh G.m.b.H. 1939–1945, 2909
Muller, F. A., with H. den Hartog, ion mobilities in G-M counters, 700
—— with others, electron mobilities in G-M counters, 178
Müller, J., distortion, in p.w.m., 1771
Muller, J. J., with others, phase distortion in feeders, 2125
Müller, R., cavity resonators, 319; intense solar flare, 19th Nov. 1949, 2206
Mulley, J. W., with others, insulation improvement for glass and ceramics by use of organosilicon compounds, 3066
Mulligan, J. H., Jr, transient response of linear dynamic systems, (C)55
Mumford, A. H., and C. F. Booth, television radio relay links, 2026
—— C. F. Booth and R. W. White, London/Castleton experimental radio relay system, 3169
Mumford, W. W., broad-band microwave noise source, 929
Muncey, R. W., use of models for investigation of room acoustics, 2695
Munro, G. H., travelling disturbances in the ionosphere, 2504
Munster, A. C., monoformer c.r. tube, (A)2355
Murakami, T., u.h.f. television tuner, 1792
Murnaghan, F. D., Introduction to Applied Mathematics, (B)1444
Murray, F. J., linear equation solvers, 2264
Mursi, Z., with J. C. P. Miller, solution of $y''-xy = f(x)$, 2556
Müser, H., with L. Genzel, photoconductivity of PbS, 1923
Musson-Genon, R., and P. Brissonneau, directional coupler for impedance measurement at u.h.f., 1720
Myers, H. G., fault location by vibration testing and continuous monitoring, 224

N

Nadler, M., network synthesis for prescribed transient response, 1604
Nagata, T., development of magnetic storm, 2501
Nai-Ta Ming. See Ming, Nai-Ta.
Nasse, G., vectorial space, 182
National Bureau of Standards, Testing by the National Bureau of Standards: N.B.S. Circular 483, (B)3219
National Bureau of Standards, Computation Laboratory, Tables of Bessel Functions of Fractional Order: Vol. 2, (B)2818
Naudé, S. M., with J. D. Louw, spurious counts in G-M counters, 701
Navascues, F., cathode-follower amplifiers, 2749
Nazarek, A., temperature distribution of upper atmosphere over New Mexico, 2214
Neale, D. M., with R. J. Hercock, use of cold-cathode relay valves with high-resistance grid/cathode circuits, 1354
Neale, J., and D. W. Burr, Thames R/T service, 899
Néel, L., *a/H* approach law and magnetic hardness, 2231; anisotropic constant and saturation of ferromagnetic materials, 2232; ferromagnetism of ferrites, 2233; saturation magnetization, of ferrites, 1166, of Ni/Zn ferrites, 1171; theory of magnetic after-effect for massive materials in the Rayleigh domain, 1659
—— and P. Brochet, molecular field of Ni/Zn ferrites, 1170
Neels, H., quartz crystals for h.f. technics, 114
Neilsen, I., with others, development of 10-cm high-power pulsed klystron, (A)1554
Nelson, G. R., magnetic-fluid clutch in servomechanisms, 237
Nelson, H., base-metal effects in thoria-coated filaments, (A)2077
Nelson, P. H., e.m. field near linear radiator, 2714
Nergaard, L. S., with R. M. Matheson, pulsed emission of oxide-coated cathodes, (A)2080
Nerinckx, M., Sperry automatic pilot Type A-12, 2317
Nestel, W., N.W. Germany u.s.w. network, 2900
Neuber, R. E., with J. W. Clark, dynamic electron-trajectory tracer, 1960
Neuert, H., with E. Fünfer, counters with pure-vapour filling, 3121
Neuweiler, N. G., ultrasonics and use in nondestructive testing, 2845
Newell, G. F., with others, electrical noise measurement, 989
Newstead, G., and D. L. H. Gibbings, error-actuated power filters, 57
Newton, A., fixed-tuned broad-band television booster, 1272; wide-band television tuners, 2046
Newton, H. W., geomagnetic storms and solar activity 1949, 1910
Nicholas, W. R., gramophone pickup design, 546
Nicolet, M., formation of the ionospheric regions, 1146; ionospheric forecasts and radio communications, 1754
Nicoll, G. R., with others, discrepancies in measurements of microwave power, 1191; properties of waveguides with periodic structure, 2706
Nielsen, A. K., acoustic resonators of circular cross-section, 2688
Nienhuis, K., with F. M. Penning, Philips vacuum gauge, 1423
Nierenberg, W. A., with others, design of racetrack synchrotron, (A)2597
Niessen, K. F., anomalous skin effect for strong h.f. field, 872; avoiding low frequencies in cavity resonators, 1377
Nijenhuis, W., generalized van der Pol equation, 2994
Nineuil, P., electrolytic polishing and vacuum technique, 2252
Nitz, H., resonance curves from tables of functions and theory of filters, 316
Niutta, A., impedance matching with exponential line, 1095; Italcable radio-receiving and cable-telegraphy station at Acilia, 1242
Nizery, A., and S. Crespi, Saint-Cyr laboratory for study of materials under tropical conditions, 676
de Nobel, J., thermal and electrical resistance of tungsten single crystals, 111
Noble, F., electrical methods of recording blood pressure, (A)955
Noble, S. W., with F. C. Williams, limitations of magnetic modulator for amplification of small d.c. signals, (A)1599
Noe, J. D., with others, distributed amplifiers: experimental results, 2750
Noël, J., with others, visualization of vibratory phenomena in resonant tube, 2965
Noll, E. M., Television for Radiomen, (B)1799
Nonnekens, J. C., design of m.f. broadcasting aerial arrays, (C)40
Nonnenmacher, W., use of U/I cores in transformers, 2989
Norbert, J., with others, quartz and its use in telecommunications, 1796
Normand, C. E., high-vacuum systems, 898
Northrop, E. W., mobile and point-to-point v.h.f. radio communications, 231
Norton, L. E., with W. D. Hershberger, servo method of frequency stabilization with spectral lines, 2140
Norwine, A. C., with others, c.r. sound spectroscope, 9
Nottingham, W. B., determination of optical properties of phosphors, 104
Nunan, C. S., with others, synchrotron r.f. system, 2598
Nuovo, M., acoustic absorption coefficient of various materials, 1566
Nuttall, T. C., spot wobble in television, 2044

O

Oberdorfer, G., Lehrbuch der Elektrotechnik, Vol. 1, (B)2111
Oberhettinger, F., and W. Magnus, Anwendung der elliptischen Funktionen in Physik und Technik, (B)2820
Odell, [illegible], and H. Y. Fan, impedance of grain boundaries in *N*-type Ge, (A)[illegible]
O'Dwyer, J., with H. Fröhlich, electronic processes in dielectrics, 1498; Time Dependence of Electronic Processes in Dielectrics, (B)2189
Oele, H. A., with A. Bierman, betatrons with and without iron yoke, 1209
O'Heffernan, H., high-gain converter for 50–58 Mc/s, 219
Ohlin, P., and O. Beckman, 800-kV Van de Graaff generator and accelerator, Uppsala, 2000
Okress, E. C., potential functions for a particular valve, 487
Oketani, S., with J. J. Trillat, electron-diffraction apparatus for investigating insulator surfaces, 3107
Oliner, A. A., with others, equivalent circuits for slots in rectangular waveguides, (A)1338
Oliphant, M. L., cyclosynchrotron, 1737
Oliver, B. M., a.v.c. as a feedback problem, (C)3014
Oliver, M. H., discontinuities in concentric-line impedance-measurement apparatus, 1188, (D)2835
Olson, H. F., and J. Preston, microphone, directional, 15, ribbon pressure, 2697
Olson, H. F., J. Preston and D. H. Cunningham, duo-cone loudspeaker, 17, 1069
—— and others, loudspeakers for personal radio receivers, (A)1319, 1760
O'Neil, H. T., theory of concave acoustic radiators, 3
O'Neill, G. D., unit of perveance, 496
O'Neill, L. H., and J. L. West, direct-reading phase meter, (A)1454, 2289
de Onis, A., use of circle diagrams for feeder problems, 837
Oppelt, W., design of control circuits with aid of circle diagrams, 1594
Orchard, H. J., synthesis of wide-band 2-phase networks, 1356
Ordung, P. F., with J. L. Bower, synthesis of RC networks, 1605
—— with H. L. Krauss, wide-band power resistors, 2732
—— with others, behaviour of resistors at h.f., (A)1855
Orsini, L. de Queiroz. See de Queiroz Orsini, L.
Ortueta, R. de L., and J. M. H. Botas, applications of square-wave generator, 2579
Ortusi, J., and G. Boissinot, slotted waveguides and their use as aerials, 2129
—— and P. Fechner, matching circuits for magnetron modulator, 552
—— and J. C. Simon, conservation of energy and Kottler's formulae, 2131; focusing of e.m. waves, 1132; principal waves in waveguides, 812
Osselton, J. W., with J. A. Lyddiard, display equipment for electrical transients, 1205
Ostroski, A. S., and R. B. Stambaugh, emulsion polymerization with ultrasonic vibrations, 2583
Ostrovidow, S., rotating-field radio beacons, 649
Ostrow, S. M., with others, back-scatter observations by the C.R.P.L., [illegible]
Otte, J., with others, Applications of the Electronic Valve in Receiving Sets and Amplifiers, (B)991
van Overbeek, A. J. W. M., with J. L. H. Jonker, ϕ-detector, a new detector valve for f.m., 505
Oyston, H. J., with others, television synchronizing-signal generator, 760

P

Pachner, J., sound field of vibrating circular plate, 525
de Packh, D. C., and M. Birnbaum, capture process in betatron-injection synchrotron, 2599
Page, C. H., transient behaviour of class-C oscillator, (A)1355
Page, L., and N. I. Adams, Jr, diode space charge, 781
Page, R. S., with others, 3-stage electron microscope, 1742
Palluel, P., with M. Denis, phase measurement for cm-wave circuits, 682, 1721
Palumbo, T. R., ceramic heaters and cathodes for valves, (A)2065
Panofsky, W. K. H., and W. R. Baker, focusing of proton beam of Berkeley cyclotron, 2600
Pantchechnikoff, J. I., soldered contacts on semiconductors, 3069
Panter, P. F., with others, signal/noise ratio in pulse-count-modulation system, 460
Paolini, E., and G. Canegallo, resistor noise, 1465, 2295
Papapetrou, A., generalization of Wilson's hypothesis on the geomagnetic field, 2203
Papas, C. H., diffraction of e.m. waves by cylindrical obstacle, 1898; radiation from a transverse slot in an infinite cylinder, 1589
—— and R. King, input impedance of wide-angle conical aerials, 288; surface currents on infinite cylinder excited by axial slot, 2190
Parent, R. J., and R. W. Schumann, pulse duration sorter and counter [illegible]
Paris, J., matching of feeder for given frequency, 2149
Parkash, O., self-quenching G-M counters, 702
—— and P. L. Kapur, temperature dependence in G-M counters, 1963
Parker, B. E., v.h.f. transmission-line tank circuit, 79
Parker, R. J., permanent magnets in torque-transmission devices, 50
Parker, W. N., and others, 500-kW beam triode, (A)1554
Parkinson, W. C., with V. C. A. Ferraro, dependence of sudden commencements on local time and geomagnetic longitude, 1142
Parnum, D. H., transmission factor of differential amplifiers, 1636
Parodi, M., Applications Physiques de la Transformation de Laplace, (B)920; quadripoles with specified iterative impedances, 838
—— and F. Raymond, analytical conditions for damping in an *n*-mesh network, 839
Parry, J. K., with D. E. Caro, stabilized 100-A power supply, 467
Partridge, J. H., Glass-to-Metal Seals, (B)2256
Parzen, B., design equations for servomechanisms, 236; impedance measurements with directional couplers and probe, 155, 940
Parzen, P., and L. Goldstein, current fluctuations in d.c. gas-discharge plasma, 2670; hydrostatic pressure in electron gas and electron-beam/e.m.-wave interaction, (A)1554
Pascucci, A. A., and H. W. Stawski, frequency-doubling by means of titanate capacitors, 1884
Pastori, M., with B. Finzi, Calcolo Tensoriale e Applicazioni, (B)2268
Patriarche, P., and P. Bonvalot, c.r. tubes for study of transients, 506
Patry, J., radiation impedance of dipole arrays, 2725
Patton, P. B., with E. J. Rudisuhle, v.h.f. links at Manila airport, 2348
Paul, W., with K. Gund, experiments with 6-MeV betatron, 2856
Pauthenet, R., thermal variation of spontaneous magnetization of ferrites 2531
Pawsey, J. L., and D. E. Yabsley, solar r.f. radiation of thermal origin, 883
Payen, —, multichannel television, 1265
Payne-Scott, R., solar radiation at metre λ, bursts, 884, characteristics of, 885
Peacock, A. G., Symposium on Electronics, (B)2008
Pear, C. B., Jr, with others, u.h.f. test oscillator using buzzer, 2581
Pearce, S. F., measurement of time constant of critically damped ammeter, 2831
Pearlstein, E., and R. B. Sutton, phenomena in diamond γ-ray counters, (A)2602; mobility of electrons and holes in diamond, 3123
Pearson, G. L., with others, hole injection in Ge, 380
Pease, M. C., analysis of broad-band microwave ladder networks, 1365; generalized formula for recurrent filters, 311
Peirson, D. H., d.c. amplifier using electrometer valve, 1121
Pelfrey, L. S., high-temperature characteristics of Ge diodes, (A)1554
Pélicant, R., surveillance radar at Le Havre, 894
Pélissier, R., attenuation of e.m. waves in transmission lines, 2972
Pelpel, J., research and new productions of Compagnie des Compteurs, 1744
Pelzer, H., with others, properties of slow electrons in polar dielectrics, 1899
Pembose, G., S.F.R. 2-kW and 20-kW s.s.b. transmitters, 777
Penndorf, R., distribution of O and O_2 in upper atmosphere, 1149
—— with H. Flohn, stratification of atmosphere, 2210
Penning, F. M., transmitting valves for dm and cm waves, 3202
—— and K. Nienhuis, Philips vacuum gauge, 1423
Penrose, H. E., with others, Outline of Radio, Television and Radar, (B)2954
Pensak, L., electron-bombardment conductivity of Se, 2520
Pepper, T. P., with others, 200-kV accelerator with gas-recovery system, (A)2589
Perdok, W. G., and H. van Suchtelen, detection of piezoelectricity of crystal fragments, 1966
Perez, J. P., αβ transformation point of quartz, 1707
Perlstain, A., applications of Ge diodes in precision measurements, 1717
Perrie, D. W., gain required for a radar echo, 1686
Perrier, F., oscillograms obtained by 'integral-curve' method, 3099
Perrot, M., with A. Blanc-Lapierre, thin Ag films, detector properties of, 2536, resistance of, 2242
Perry, S. S., all-band mobile aerial system, 2182
Peters, J., validity of Nyquist's stability criterion, 1593
Peterson, A., continuously adjustable a.f. low-pass and high-pass filters, 2744
Peterson, A. M., long-scatter echo patterns, (A)721
—— with others, meteor-trail-echo study of winds in upper atmosphere,

[illegible]
Peterson, C., procedure in industrial designing, (A)1559
—— with others, absolute measurement of resistance, 932
Peterson, D. W., coaxial-line bead design, (D)277
Peterson, J. M., with others, synchrotron r.f. system, 2598
Petree, B., with R. L. Henkel, h.v. power supply for e.s. analyser, 469
Petrie, W., with others, origin of 10-cm radiation from polar aurora, 2776; radar reflections from auroras, 1688
Petritz, R. L., and A. J. F. Siegert, theory of noise in semiconductors, (A)2477
Petrova, N. M., system of finite mass in general theory of relativity, 868
Pettit, J. M., stagger-tuned amplifier design, (A)1355; u.h.f. triode oscillator with series-tuned circuit, 2452
Peuteman, A., electronic decade counter with neon indicators, 2733
Pfeil, K., design and mounting of pickup arms, 1577
Pfister, W., effect of D layer on very-low-frequency waves, (A)723, 1223; wave propagation over the earth, 438
Pfost, W., 3-stage h.f. filter with variable bandwidth, 843
Pfuntner, R. A., R. E. Franck and F. R. D'Entremont, butyl moulding insulation for small transformers, 2802
Phillips, F. M., losses in screened single-layer solenoid, 1352
Phillips, G. J., with others, analysis of radio fading observations at spaced receivers, 1233
Phillips, W. E., permittivity of air at λ 10 cm, 2827
Philpott, S. F., radio interference suppression, 1763
Piocchi, M., selective amplification by means of RC feedback networks, 3011
Pichal, H. J., output impedance control, (D)1337
Picht, J., theory of electron acceleration in alternating magnetic field, 3034
Pickens, D. H., and J. N. Van Scoyoc, phase-shift band-pass filters, 1881
Pickles, S., 335-Mc/s equisignal glide slopes, 2514
Pidd, R. W., with others, design of racetrack synchrotron, (A)2597
Piddington, J. H., and H. C. Minnett, 24-kMc/s radiation from the moon, 612
Pierce, J. A., pulse transmission over long distances, (A)722
Pierce, J. R., increasing space-charge waves, 874; Theory and Design of Electron Beams, (B)2389; travelling-wave oscilloscope, 264; travelling-wave valves, 1810, 2377, 3203
Pigg, J. C., with others, Ge semiconductors produced by neutron bombardment, 2195
Piggott, W. R., irregular phenomena in ionosphere, and solar flares, (A)1411
—— with E. V. Appleton, ionospheric storms, 891
Phil, G. E., with others, speech sounds and their statistical properties, (A)1319
Piloty, R., Jr, nonuniform rectangular waveguides, field in, 550, theory of, 31
Pimonov, L., rapid automatic frequency analyser, 936
Pineo, V. C., meteor activity and sporadic-E reflections, 2774
de la Pinsonie, B., radar screens, 267
Piotrovski, A. A., forced oscillations in spherical cavity resonator, 2448
Pipes, L. A., summation of Fourier series by operational methods, 1948
Pippard, A. B., waveguide interferometers as differential wavemeters, 162
Pirenne, J., properties of KH_2PO_4 and KD_2PO_4 crystals, 1428
Plotkin, H. H., and J. E. Goldman, effect of tension on magnetic properties of Fe/Co, (A)2534
Pocock, S. N., electronic instruments in diagnostic medicine, (D)2588
Podliasky, I., and J. Zakheim, high-accuracy radio-telemetry, 1733
Poensin, P., with others, magnetostriction measurement with strain gauge, 2492
Poeverlein, H., ray paths of radio waves in the ionosphere, 718, 2875
Pohlman, R., with T. Hüter, optical measurement of ultrasonic absorption, 7
Poincelot, P., with P. Chavasse, application of negative feedback to electroacoustic systems, 1068
van der Pol, B., Heaviside's operational calculus, (A)2257
Polder, D., with H. G. Beljers, *g*-factors of ferrites, 1930
Pollack, L., E. Bradburd and I. Krause, design considerations in television transmitters, (A)1534
—— with E. Bradburd, wide-band r.f. problems in television transmitters (A)1534
Pollaczek, F., theory of coaxial cable, 1072
Pollard, J. R., with R. C. Bacon, dekatron counter tube, 2066
Polonsky, J., high-efficiency broadcasting transmitters, 2369
Pool, S. D., with R. G. Medhurst, v.h.f. correction factors for slotted lines 2836
Poole, A. B., low-power industrial synchronous motors, 2635
Popkin-Clurman, J. R., inexpensive test-pattern generator, 2842
Possenti, R., dissipative quadripoles with dual iterative impedance, 1615
Post, E. J., HT-cut for quartz crystals with zero temperature coefficient, 115
Potier, G., use of modulation converters in pulse multiplex equipment, 2024
—— with J. Icole, C.N.E.T. pulse multiplex R/T equipment, 997
Pottier, J., and V. Raievski, remote control of pile reactions, 3128
Pound, J., dielectric heating in foundry work, 423
Power, D. W., with others, pencil-type u.h.f. triodes, 501
Powers, A. E., with J. F. Libsch, rapid tempering by induction heating, 3113
Powles, J. G., and W. Jackson, dielectric properties of high-permittivity materials at cm λ, 121
Prache, P. M., inductors and transformers at h.f., 1875
—— with M. Prudhon, theory of networks, 1097
Pravenec, L., remote control of Tesla RU public address system, 2410
du Pré, F. K., R. A. Hutner and E. S. Rittner, conduction and emission mechanism of Ba/Sr oxide cathodes, 2071
Preist, D. H., annular resonators for multi-valve u.h.f. generators, 1885; u.h.f. oscillator, 1109
Preiswerk, E., and C. Meyerhans, ethoxylene resins, araldite, 126
Prescott, J. R., multigrid valves as electrometers, 150
Pressey, B. G., and G. E. Ashwell, fixed H-Adcock v.h.f. direction finder 1418
Pressler, H., development of television in Germany, 2906
Preston, J., with H. F. Olson, microphone, directional, 16, ribbon pressure, 2697
—— with others, loudspeaker, duo-cone, 17, 1069, for personal radio receivers, (A)1319, 1760
Preston, J. S., constitution and mechanism of Se photocell, 3199
Price, A. T., induction of electric currents in nonuniform thin sheets and shells, 352
Price, W. J., emission, conductivity and contact potential of thoria cathodes, (A)2072
—— and H. B. Huntington, acoustical properties of anisotropic materials, 1049
Prichard, A. C., M. A. A. Druesne and D. G. McCaa, increase of *Q* and reduction of aging for quartz crystal blanks, 375
Prince, M. D., with M. A. Honnell, television image reproduction by v.m. method, (A)1534
Pringsheim, P., Fluorescence and Phosphorescence, (B)1711
Proctor, R. F., input impedance of low horizontal dipole aerials, 2134
Prokott, E., a.c. h.f. conversion by means of valves, 827; pulse modulation, 1769
Prowse, W. A., u.h.f. gas breakdown, 2796
Pruden, H. M., and D. F. Hoth, vibrating-reed selective-calling system, 740
Prudhon, M., and P. M. Prache, theory of networks, 1097
Pujolle, J., and J. Boisard, measurement of reverberation times of Radiodiffusion-française studios, 2962
Pullen, K. A., double-moving-coil electrical instruments, 685; 'G' curves in valve-circuit design, 292
Pulling, M. J. L., B.B.C. mobile sound-recording equipment, 273
Pumphrey, R. J., upper frequency limit for human hearing, 2959
Pungs, L., with K. Lamberts, wide-band m- and dm-wave aerials, 2426
—— with others, interference in region between two f.m. common-wave transmitters, 990
Punnett, S. W., a.f. selective amplifiers, 1644
Pursey, H., output-impedance control, (D)1337

Q

Quarrington, C. A., with others, Outline of Radio, Television and Radar, (B)2954
de Queiroz Orsini, L., selective i.f. amplifiers, 596, 1120, (C)1645
Quimby, E. H., medical applications of ionizing radiations, (A)955

R

Rabier, J., principles common to certain radio navigation systems, 1919
Rabinow, J., magnetic-fluid clutch, 2585
Radford, W. H., with others, sound-system design for reverberant auditoria, (A)1319
Radio Corporation of America, Laboratories Division, analysis of sampling principles of dot-sequential colour-television system, 2640; co-channel and adjacent-channel interference of television signals, 1798, 2653; 6-Mc/s high-definition colour-television system, 1263
—— and Victor Division, receivers for dot-sequential colour television, 2648
Radley, W. G., Heaviside and development of telephone transmission, (A)2340; speech intelligibility in deafness or loud noise, (D)270
Rado, G. T., M. H. Johnson and M. Maloof, single-pulse voltmeter, 939
Raes, A. C., contribution to the study of reverberation, 2963
Raffin-Roanne, R. A., l.f. generators, 692
Raffle, J. F., with I. A. D. Lewis, scale-of-ten counting unit, 830
Ragan, G. L., with others, particle injection into accelerators, 1471
Ragazzini, J. R., and L. A. Zadeh, wide-band a.f. phase meter, 1724
—— with L. A. Zadeh, extension of Wiener's theory of prediction, 2808
Raievski, V., with J. Pottier, remote control of pile reactions, 3128
Ramberg, E. G., with J. Hillier, contrast improvement in electron microscopy, 3117
Ramsey, W. S., 5–40-kV power supply, 1257
Rand, G., with S. G. Lutz, ultrasonic operation of lantern-slide changer, [illegible]
Rand, P. S., television interference suppression, 2156, in 160-m amateur-band transmitter, 476
Raoult, G., pulse method for intense magnetic fields, 90
Ratcliffe, J. A., propagation of long and very long waves, (A)724, regular behaviour on reflection from ionosphere, (A)1486; wave diffraction in the ionosphere, (A)719
—— with L. G. H. Huxley, ionospheric cross-modulation, 211, (D)2327
Ratcliffe, R. A., and R. S. Zucker, mobile f.m. communication equipment, [illegible]
Ratheiser, L., Rundfunkröhren, Eigenschaften and Anwendung, (B)1835
Randorf, W., change of valve mutual conductance with frequency, 1801, (D)[illegible]
Rawer, K., geometrical optics of ionosphere, 207, 717, 3142
—— with E. Argence, absorption in parabolic ionospheric layer, for oblique incidence, 1154, for vertical incidence, 627
Raymond, F., with M. Parodi, analytical conditions for damping in an *n*-mesh network, 839
Raymond, F. H., electronics and experimental mathematics, 919, (C)1714; general type of analogue computer, 1443; propagation on a heterogeneous transmission line, 549; theory of servomechanisms, 1251
Raymond, R. C., electronic contour mapping, 2865
Rayner, G. H., reduction of input capacitance of cathode follower, 858
—— and L. H. Ford, stability of inductance standards, 926
—— and R. W. Willmer, effect of earth admittances in a.c. bridges, 1973
Read, O., The Recording and Reproduction of Sound, (B)2414
Redding, E. D., with W. C. Michels, synchronous detector, 222
Redhead, P. A., H. LeCaine and W. J. Henderson, electron cyclotron, 1472
—— with W. J. Henderson, electron cyclotron, 198
Redheffer, R. M., basis of network theory, 1609
—— with others, separation of variables in Laplace's equation, 2260
Reed, H. R., with L. A. Ware, Communication Circuits, (B)1650
Reed, J., low-*Q* microwave filters, 2742
Regenstreif, E., e.s. lenses, focal length and chromatic aberration of, 1477, theory of 3-diaphragm type, 1213, transgaussian rays in, 2314; principal rays for family of electron lenses and mirrors, 1743
Regert-Monod, O., and P. Seguin, composition, properties and applications of silicones, 1176
Reich, H. J., and P. M. Schulteiss, transistor trigger circuits, (A)1355
—— and R. L. Ungvary, transistor trigger circuit, 53
Reichardt, W., control, feedback and negative resistance co-ordinated, 1347
Reid, J. D., effect of television channel allocation on receiver design, 258
Reiffel, L., d.c. bias control of thyratron anode current, 503
Reinartz, J. L., brazing by pulse methods, 971
Remeika, J. P., with others, properties of Ni-ferrite single crystals, (A)2529
Renwick, W., with M. V. Wilkes, EDSAC calculating machine, 917
Rettinger, M., magnetic recording for motion pictures, 1572
Reusse, K. W., physics and technics of modern u.h.f. transmitting valves, 1807
Reverdin, D. L., electron-optical mapping of space-charge field in magnetron, 2315
—— with L. Marton, electron-optical properties of space-charge clouds, 3118; stroboscopic observation of time-variable fields, 2584
Revirieux, P., sporadic-E layer, June/July 1949, 1222
Reyner, J. H., The Magnetic Amplifier, (B)2466
Rhodes, P., Bloch integral equation and electrical conductivity, 3023
Ribchester, E., f.m. method for measurement of ultrasonic absorption in liquids, 2116
Rice, S. O., communication in presence of noise, 1512
Rich, S. R., ultrasonic pulse instruments, (A)1467
Richard, C D., Jr, figure of merit and quality ratio for oxide-coated cathodes, (A)2081
Richards, D. L., with others, square-law rectifier circuits for meters, 3096
Richards, J. T., beryllium copper, 2254
Richardson, E. G., ultrasonics in fluids, 6
Richardson, J. M., theory of contact noise, 1391
Richman, D., limit of pulse time-difference measurements, 2894
Ridenour, L. N., high-speed digital computers, 1952
Rideout, V. C., wide-band series-parallel-tuned transformer design, 2445
—— and T. P. Tung, analysis and design of band-pass distributed amplifier, (A)1355
—— with J. H. Crow, photocell Type CE-70V, 1288, 2928
—— with Han Chang, reactance-valve oscillator, 326
Ridgers, C. E. S., i.f. transformer design, 1595
Riedel, J., frequency control for the bevatron r.f. voltage, (A)3116
Riesz, R. R., a.f. spectrography: physiological applications, (A)955
Riethmuller, J., with F. Violet, experimental investigation of oxide cathodes, 2380
Rigal, R., Les Hyperfréquences, Circuits et Propagation des Ondes, [illegible]
Ringger, W. A., Jr, filters for protection of carrier signals on distribution systems, 579
Ritchey, N. B., 400-Mc/s amplifier performance of Type SN-973B r.f. pentode, (A)1355
von Rittberg, G., with A. Kussmann, magnetic properties of Pt-Fe alloys, 2783
Rittner, E. S., theory of photoconductivity in infrared-sensitive semiconducting films, 2790
—— with others, conduction and emission mechanism of Ba/Sr oxide cathodes, 2071
Rivault, R., fine structure of type-4 atmospherics, 2508; scattered echoes near F_2 critical frequencies, 1487
Roberts, J. A., wave amplification by interaction with electron stream, 606
—— with V. A. Bailey, graphical study of dispersion of electro-magneto-ionic waves, 1665
Roberts, S., dielectric constants, of ionic crystals and $BaTiO_3$, 1656, of Pb and Ba/Pb zirconates, 1434
Roberts, W. van B., and L. L. Burns, Jr, mechanical r.f. filters, 59
Robertshaw, R. G., with W. E. Willshaw, operation of magnetrons near critical anode voltage, 1557
Robertson, S. D., admittances of planar valves at 4000 Mc/s, 1809; passive 4-pole admittances of microwave triodes, 1315
Robin, L., calculation of bandwidth for f.m. transmissions, 1028
Robinson, C. S., with others, 300-MeV betatron, performance of, (A)2594, 80-MeV model, 2593
Robinson, C. V., small G-M counters, for biological applications, (A)955, probing, 1732
Robinson, J. G., with others, linear preamplifier for use with long coaxial cable, 3012
Rocard, Y., possible modulators based on the Hall effect, 3007
—— and J. Loeb, servomechanisms and telecontrol, 1253
—— with P. Grivet, feedback in analogue-computer networks, 2810
Rocco, M. D., and J. B. Smyth, diffraction of h.f. radio waves, 208
Rod, R. L., with F. E. Spaulding, Jr, direct-reading loran indicator, 1160
Roddam, T., measurement of intermodulation distortion, 1463; narrow-band pulse communication, 2345; output-impedance control, 1070, (D)1337; positive feedback, 2463; square-wave excitation of bridges, (D)942
Rodenhuis, K., receiving triodes EC80 and EC81 for dm λ, 1814; limiting frequency of triode oscillator, 3008
Roe, J. H., frequency response adjustment in video amplifiers, 2896
Roeschen, E., Fresnel's reflection formula for long waves, 679
Roessgen, M., requirements of centralized remote-control systems, 1744
Rogell, P. S., modulation conversion in waveguide, 2895
Rogers, D. C., current-density distribution in aligned-grid valves, [illegible] suppression of impulse noise, 453
Rogers, T. H., vacuum rectifier for high power and voltage, 2987
—— with S. T. Yanagisawa, thoria cathodes in h.v. rectifiers, (A)2070
Rohde, L., technique of u.s.w. broadcasting, 2898
Rohrer, E. R., with others, scintillation type alpha-particle detector, [illegible]
Rondeau, H. F., self-balancing resistance bridge, 689
van Rooden, C. S. W., with others, electron mobilities in G-M counters, 178
Rooksby, H. P., and A. H. McKeag, investigation of phosphors by X rays, 2227
Roquet, J., fired earths, demagnetization by reheating at increasing temperatures, 1169, remanence of, 962
de Rosa, L. A., errors in aerial navigation and d.f., (A)1416
Rose, A. S., and J. C. Turnbull, tests of Cr Fe alloys for cones of c.r. tubes, 1181
Rose, D. C., and J. N. Bloom, saturated-core recording magnetometer, 2276
Rose, F., and E. Spenke, easy-flow characteristics of Cu_2O rectifiers, 755
Rose, G. M., D. W. Power and W. A. Harris, pencil-type u.h.f. triodes, 501
Rosen, J. S., dielectric constants of liquids and gases under pressure, 1433
Rosen, P., propagation of e.m. waves in tube with coaxial d.c. discharge, 279
Rosenberg, W., J. S. Fleming and E. D. Hart, radar test set for 9–9·7 kMc/s, 404
Rosencrans, C. A., directive microwave aerials, 1869
Rosenhamer, H., mathematical theory of nonlinear phenomena, 581
Rosenthal, L. A., very-low-frequency sinusoidal-voltage source, 2293
Rosevear, G. J. R., with V. G. Hoptroff, wire coverings and sleeving for Service equipment, 2245
Roske, E., temperature compensation of transmitters, 1549
Ross, A. E., theory of p.f.m., 461
Ross, A. H., with S. H. Van Wambeck, diversity-reception techniques, (A)1501
—— with others, comparison of modulation methods for R/T, (A)1511
Ross, H. D., Jr, with R. E. Beam, impedance and radiation characteristics of slotted-cylinder aerials, 2710
Ross, M. A. S., acoustics of rooms, (A)533
Ross, S. G. F., design of cathode-coupled amplifiers, 2456
Ross, W., Lateral Deviation of Radio Waves reflected at the Ionosphere, (B)965; polarization errors in Adcock d.f. equipment, 1419; variations in direction of arrival of h.f. radio waves, (A)1497
Rossi, B. B., and H. H. Staub, Ionization Chambers and Counters, Experimental Techniques, (B)2805
Roth, A., eddy-current losses in electrical apparatus, 3095
Roth, L. M., with others, structure of PbS, PbSe and PbTe films, (A)2537
Roth, W., electronic duplicator attachments for machine tools, (A)1467
Rothe, H., sensitivity of receiving valves, 986
Rothe, R., Höhere Mathematik für Mathematiker, Physiker, Ingenieure, (B)1445
Rothery, J. L., and An Wang, hysteresis asymmetry for Ni/Fe alloy, [illegible]
Rothlein, B. J., and F A. Stahl, photoelectric effects in Ge, 1294
—— with P. H. Miller, Jr, work function of contaminated metal surfaces, (A)[illegible]
Rothstein, J., accelerated life-testing of valves, (A)1454
Rotman, W., channel-guide aerial, 2718; single-surface corrugated waveguides, (A)1338
Roubine, E., directive properties of receiving aerials, 2424; mathematics and radio technics, 1438
Rouch, J., atmospheric e.s. field at Monaco, 1687
Rouland, R., electrical conductivity, 2543
Round, H. J., impedance measurement using c.r.o. as indicator, 2279
Rouse, G. F., with R. Forman, Mg Ni base for oxide cathodes, (A)2070
Rousseau, J., de luxe receiver with very high musical fidelity, 785; French broadcasting receivers for 1949–1950, 215; receiver sensitivity and background noise, 3148; 1950 components exhibition, Paris, [illegible]
Roux, M., with C. Guillaud, properties of mixed ferrites of Ni and Zn, 905
Rowen, J., radiation efficiency of elliptically and linearly polarized aerials, (A)1338
Rowlands, R. O., impedance-matching networks, 1614; impedance transformations in 4-element band-pass filters, 312
Rowley, R. D., with C. E. Arntzen, silicone rubbers, 127
Roy, R., with S. R. Khastgir, waveforms of atmospherics, 893
Roys, C. S., with others, radiation from circular current sheets, (A)1338
Roys, H. E., distortions in sound-recording systems, (A)1319
—— with H. E. Haynes, variable-speed turntable for use in pickup calibration, 1578, 2701
Rosian, I. W., with S. V. Hart, thickness gauge for moving material, [illegible]
Rudd, J. B., design of double-tuned transformers, 562
Rudenberg, H. G., and F. Kennedy, 200-Mc/s travelling-wave chain amplifier, 595
—— with F. Kennedy, wide-band chain amplifier, 594
Ruderman, I. W., with others, rise times of photomultiplier voltage pulses 2964
Rudert, F., with others, television developments by Fernseh G.m.b.H. 1939–1945, 2909
Rudisuhle, E. J., and P. B. Patton, v.h.f. links at Manila airport, 2848
Rueggeberg, W., with J. B. Whitehead, dielectric loss with changing temperature, (A)137
Ruhland, R., with B. Ciscel, closed-cycle 8-channel pen recorder, 2797
Ruhrmann, A., direct-reading h.f. phase meter, with c.r.o. indicator, 2574, with pointer indicator, 3101; improvement of properties of exponential line by compensation devices, 1583
Rumsey, V. H., with T. H. Crowley, geometry and impedance characteristics of radiating systems, (A)1338
Russell, O. J., G-M tubes in industrial radiology, 1208
Rust, H. H., generation of ultrasonic vibrations by electrostriction, 2957 measurement of low direct voltage by conversion to alternating voltage, 3089
—— and H. Endesfelder, measurement of small direct voltages, 1451
Rusterholz, A. A., grid emission, 2985; production and application of electron beams, 1128
Ruston, J., crystal discriminator for f.m. oscillator stabilization, (A)1556
Rutland, D. F., with J. J. Gilvarry, voltage-stabilization using current stabilized supply, 244
Ruze, J., wide-angle metal-plate lenses, 1345
Rycroft, J. L., and L. A. Thomas, salvaging electrically twinned quartz 376
Rydbeck, O. E. H., and D. Stranz, ionospheric effects of solar flares, 1948 619
Ryder, J. D., Networks, Lines and Fields, (B)865
Ryder, R. M., equivalent circuits for transistor action and noise, (A)1020
—— and R. J. Kircher, circuit aspects of transistor, 334
Rzhanov, A. V., piezoelectric effect in $BaTiO_3$, 901
Rzhevkin, S. N., energy flux in fields of spherical sound radiators, 1220

S

Sabine, H. J., measurement of acoustic absorption coefficient, 2404
Sacasa, R. G., optimum working frequencies for ranges up to 2500 km 2615; probable law of s.w. propagation from London to Madrid 2614; propagation, of 10-Mc/s waves over ranges of 300–1300 km 2877, of 12-Mc/s and 15-Mc/s waves over ranges of 500–2400 km 2878, Washington and Madrid, s.w. forecasts, [illegible]; reception of various overseas s.w. transmissions, 2323
Sacerdote, G. G., inductively coupled recurrent network, 1357
—— with A. Bressi, recording of nonlinear distortion, 2964
Sachse, H., titanates with high dielectric constant, 120
Saddy, J., and N. Arpiarian, luminescence-extinction effect of Ni and C on ZnS, 2524
Sadowsky, M., double-layer projection-tube screen for television, 2967
Sage, M., and C. Guillaud, crystalline structure and magnetic properties of Ni/Zn ferrites, 2530
Saic, F. C., piezoelectric crystals in radio receivers, 1502
St. John, R. E., d.c./a.c. converter for servo systems, 754
Salmet, G., graphical study of cathode-follower circuits, 1639
Salow, H., secondary-electron emission of metal mixtures, 2596
Salpeter, J. L., physical basis of wave filters, 2197
Saltzmann, H., and C. G. Montgomery, velocity of propagation of discharge in G-M counters, 2863

Salzberg, B., propagation of e.m. waves through stratified medium, 3131
Samal, E., circuit equivalents for linear a.c. elements, 2983
Samuel, A. L., axially symmetric electron beams of uniform cross-section, 481
—— with R. S. Julian, co-ordinate c.r. tubes for use with e.s. storage tubes, 2367
Samuelson, D., single-channel mobile transmitter-receiver unit, 2894
Sandeman, E. K., Radio Engineering, Vol. 2, (B)1318
Sanders, J. H., with others, 200-kV accelerator with gas-recovery system, (A)2589
Sanders, R. W., industrial television equipment, 2645
Sanderson, W. T., effects of sky wave on planning of m.f. navigation aids, (A)1490
Sands, M. L., with W. C. Elmore, Electronics: Experimental Techniques, (B)2007
—— with others, operation of M.I.T. 350-MeV synchrotron, (A)2595
van Santen, J. H., with G. H. Jonker, ferroelectricity of titanates, 1942
Saraga, W., constant-phase-shift networks, (D)1093; design of wide-band phase-splitting networks, 2736
—— and J. Freeman, phase-shift calculation for filters, 1093
Sárkány, T., distributed amplification, (D)332
Sarser, D., and M. C. Sprinkle, musician's amplifier, 70
Sarti, A., statistical study of irregularities in coaxial cables, 1073
Sartre, L., Laboratoire central d'Électricité, Fontenay-aux-Roses, 2103
Sass, E. J., with D. Mackey, design of printed-circuit television tuner, (A)1534
Sancet, H., with L. Thibieroz, manufacture of French miniature valves, 1802
Saunders, W. K., with S. Silver, external field of slotted-cylinder aerials, 1588; radiation from transverse rectangular slot in circular cylinder, 2980
Savory, L. E., experiments with the Hartmann acoustic generator, 2956
Saxon, D. S., and R. A. Hutner, electronic properties of crystal model, 878
—— A. Baños, Jr, and L. L. Bailin, radiation characteristics of shielded turnstile aerial, (A)1866
Saxton, J. A., reflection coefficient of snow and ice at v.h.f., 900
Say, M. G., with others, Outline of Radio, Television and Radar, (B)2964
Sayer, W. H., Jr, and J. M. De Bell, Jr, television aerial diplexers, (A)1355, 2651
Sayre, D., linear sweep generators, 2453
Schaaffs, W., e.s. short-time measurement, 921
Schacht, E. L., Voice-of-America a.m. 150-kW transmitter, Munich, 1776
Schade, O. H., high-efficiency deflection and h.v. systems for kinescopes, 1783
Schaetti, N., electron-multiplier photocells, 2929; scanning tube for film, 1261
Schafer, C. R., aircraft fuel gauge, 1745
Schafer, H. G., with L. G. Johnson, magnetic-amplifier frequency control for alternator, (A)2355
Schäfer, O., and R. Honerjäger, lines and circuit elements for microwave measurements, 3068
—— and G. Lander, electrical device for calculation of product integrals, 1734
Schafer, T. H., and others, frequency selectivity of ear, 2692
Schärli, O., radiator for high-power transmitting valves, 2933
Schatz, E. R., and E. M. Williams, exponential-line pulse transformer, (A)1555
Schecter, H., flutter in recorded speech and music, (A)1319
Scheibe, A., P.T.R. equipment for absolute frequency measurement, 408
—— and U. Adelsberger, performance of P.T.R. quartz clocks and length of the astronomical day, 2275
Scheiner, S. R., bifilar i.f. coupling transformers, 2138
Schelkunoff, S. A., Applied Mathematics for Engineers and Scientists, (B)1716
Schiaffino, P., with L. Albanese, coaxial-cable telephony systems, 1944
Schilling, W., theory of magnetic amplifiers, 1597
Schlesinger, K., built-in aerials for television receivers, 819, 2719
Schmelzer, C., measurement of electrical constants of materials, 393; signal generators, 410
Schmidt, C. R., frequency division with phase-shift oscillators, 2166
Schmidt, H., combination loudspeaker, 2409
Schmidt, H. M., unequivocal frequency measurement by comparison with standard, 2828
Schmitter, K. H., with others, interference in region between two f.m. common-wave transmitters, 990
Schnitger, H., amplification and generation of microwaves with travelling-wave valves, 3004; valves for frequencies above 1000 Mc/s, 1295
Scholte, T. G., dielectric constant of polar liquids, 124
Schön, M., sulphide phosphors, luminescence of, 1162, width of emission bands of, 1163
Schönbacher, K., inductance of single-layer solenoids, 52
Schönhammer, K., various types of amplifier, 330
Schonland, B. F. J., with D. J. Malan, e.s. fluxmeter with short response time, 2281
Schonstedt, E. O., and H. R. Irons, airborne magnetometer for measuring earth's total field, 697
Schooley, A. H., ripple tank for phase-front visualization, 2841
Schorr, M. G., and F. J. Beck, Jr, e.m. field of conical horn, 2979
Schott, F. W., and K. R. Spangenberg, analogue analysis of losses in reflex cavity resonators, 584
Schott, L. O., with O. O. Gruenz, Jr, portrayal of pitch of speech sounds, 12
Schrader, H. J., with others, pictorial display in aircraft navigation and landing, 1894
Schreiner, S., with others, speech transmission in channels of restricted bandwidth, (A)1511
Schröter, F., television, wartime developments in Germany, 472
Schulman, J. H., C. C. Klick and R. J. Ginther, variation of emission spectrum of $(Zn, Be)_2SiO_4$-Mn with decay time, 2522
Schulteiss, P. M., with H. J. Reich, transistor trigger circuits, (A)1355
Schultz, F. V., diffraction by prolate spheroid, (A)1392
Schultz, H. W., J. F. Calvert and E. L. Buell, photoformer in anacom calculations, 2814
Schultz, M. A., linear amplifiers, 1888
Schulze, A., and D. Bender, carbon-layer resistors, 302
Schulze, W. M. H., alkaline-earth titanates as dielectrics, 911
Schumann, R. W., with R. J. Parent, pulse sorter and counter, 2784
Schumann, W. O., passage of e.m. waves, of frequency below the critical frequency, through plasma, 3134
Schwan, H., measurement of dielectric properties at dm λ, 2546
Schwartz, E., K-factor and picture definition in television transmissions, 2839
Schwarz, R. J., with K. S. Miller, analysis of a sampling servomechanism, 2029
Schwinger, J., with H. Levine, diffraction by aperture in infinite plane screen, 83, (D)84, 1897
Scorer, R. S., evaluation of $\int_{x_1}^{x_2} f(x)e^{i\phi(x)}dx$ and tabulation of

$(1/\pi)\int_0^\infty \sin\left(ux+\frac{1}{3}u^3\right)du$, 2552

Scott, D., underground loudspeakers, 18
Scott, H. H., with W. L. Black, a.f. measurements, 138, for broadcasting systems, 147, 148
Scotto, —, with — Vienne, 'pipology' radar operating technique, 2219
Scowen, F., An Introduction to the Theory and Design of Electric Wave Filters, (B)2177
Scroggie, M. G., interference from television receivers, 1510; RC-coupled power stage, 1388; simple c.r.o., 1458
Seaton, J. W., 3-component saturable-core magnetometer, 925
Seaton, M. J., with D. R. Bates, theory of formation of ionosphere layers, 1407
Seddon, J. C., square-wave keying of oscillators, 1285
Seeliger, R., electron diffusion in ionosphere, 1150; electron production in E layer, 828
Seely, S., Electron-Tube Circuits, (B)1652
—— with others, radiation from circular current sheets, (A)1338
de Seguin, L., biological properties of microwaves, 425
Seguin, P., with O. Regert-Monod, composition, properties and applications of silicones, 1176
Seibert, J. L., with others, u.h.f. television station KG2XAK, Bridgeport, 1795
Seitz, F., electron multiplication in crystals, 879; theory of rectification, (A)240
—— with G. W. Castellan, transition from insulation to conduction in Si, (A)2545
Selby, M. C., valve-voltmeter circuits, 1970
—— and L. F. Behrent, bolometer bridge for r.f. voltage measurement, 1971
Sellers, G. W., with others, high-selectivity mobile receiver, (A)1501
Selsted, W. T., with B. H. Smith, loudspeaker for 5–20 kc/s, 806
Selz, J., measurement equipment for coaxial-cable circuits, 690
Sen, Hon Yung. See Hon Yung Sen.
Sen, S. N., with S. C. Sirkar, u.h.f. absorption in organic liquids, 609
Servant, R., measurement of very heavy d.c., 1455
Sessler, W. M., and A. V. Masket, high-speed electronic scaler circuit, 2587
Sette, D., velocity of ultrasonic waves in liquid mixtures, 1562
Severin, H., slot radiator as magnetic dipole for cm λ, 2712
—— with E. Meyer, demonstrations with cm waves, 1044
Sewell, L. R., with others, operation of the 184-in. cyclotron, 962
Seybold, A. M., class-B modulator circuit using Type-807 valves, 479; filters for television-interference suppression, (A)1355
Shackelford, C. L., with H. F. Ivey, thermionic-emission calculations, (A)1902
Shadowitz, A., with M. Silver, high-ratio multivibrator frequency divider, 588
Shannon, C. E., programming a computer for playing chess, 1959; communication theory, recent developments in, 1764, 3154, secret systems, 993
—— with H. W. Bode, smoothing and prediction theory for stationary time series, 1713
Shapiro, B., with others, structure of PbS, PbSe and PbTe films, (A)2537
Shapiro, E., rate of disappearance of thoria from filaments, (A)1935
Sharp, L. W. D., design problems of v.h.f. mobile equipment, 2628
Sharpe, B. A., aircraft radio altimeters, 897
Shaull, J. M., adjustment of frequency and time standards, 1447
Shaw, E. A. G., locking of oscillators in integral and non-integral frequency ratios, 2578
Shaw, R. F., arithmetical operations in binary computer, 3081
Shebes, M. R., coaxial cable with elliptical cylindrical conductors, 27
Sheehy, M. J., underwater transmission of 24-kc/s signals, 1055
Shelton, G. R., with others, properties of Ca-Ba titanate dielectrics, 1709
Sheperd, W. G., efficiency of reflex oscillators, 2948
Sherman, D. L., theory of steady-state oscillations, 869
Sherman, J. M., WTCN a.m.-f.m. television station, Minneapolis, 1773
Shevchik, V. N., theory of klystron, 1830
Shewmaker, C. A., with others, frequency selectivity of ear, 2692
Shiniberov, P. Ya., coaxial cable and its optimum design, 2415
Shinn, D. H., with others, analysis of radio fading observations at spaced receivers, 1233
Shive, J. N., internal photoeffects in Ge, (A)668; new Ge photoresistance cell, 778; phototransistor, 2930
Shockley, W., effect of magnetic fields on conduction, 2479; *p-n* junctions in semiconductors, 379; theory of transistor, (A)1026
—— G. L. Pearson and J. R. Haynes, hole injection in Ge, 380
—— with J. Bardeen, deformation potentials and mobilities in non-polar crystals, 3032; scattering of electrons in crystals, 3031
Shoenberg, D., Magnetism, (B)2202
Shyman, C. S., with D. D. Cherry, radio Doppler investigation of meteor speeds, 1907
Sichak, W., and H. A. Augenblick, tunable microwave waveguide filters, (A)1355
Sidentopf, H., atmospherics, 861; origin of Mögel-Dellinger effect, 3145
Siegbahn, K., with H. Slätis, magnetic lens, 200
Siegert, A. J. F., with R. L. Petritz, theory of noise in semiconductors, (A)2477
Sigrist, W., electronic fundamentals of microwave valves, 1894
Silberstein, R., oblique-incidence propagation work of C.R.P.L., (A)790
—— with others, back-scatter observations by the C.R.P.L., 2325
Siling, P. F., Provisional Frequency Board, 1245
Sillars, R. W., insulating and semiconducting materials, (A)119
Silleni, S., ionosphere data deduced from study of radiotelegraphic transmissions, 1753
—— with others, F_2-layer critical-frequency recordings, Rome, Sept. 1948–March 1949, 1684
Silver, M., and A. Shadowitz, high-ratio multivibrator frequency divider, 588
Silver, S., and W. K. Saunders, external field of slotted-cylinder aerials, 1588; radiation from transverse rectangular slot in circular cylinder, 2980
Simmons, B. D., and R. J. Urick, plane-wave reciprocity parameter and transducer calibration, 531
Simmons, L. F. G., hot-wire anemometer for low speeds, 972
Simmons, L. M., with F. Gutmann, electrolytic thermistors, 48
Simon, J. C., focusing of e.m. waves, 1661; Fresnel's laws for cm waves, 1663
—— with J. Ortusi, conservation of energy and Kottler's formulae, 2131; focusing of e.m. waves, 1132; principal waves in waveguides, 812
Simpson, J. A., with others, fringe fields of ferromagnetic domains, 1212
Simpson, J. A., Jr, theory and properties of low-voltage radiation counters, 2859
Simpson, J. H., conduction and breakdown processes in solids, 1429
Sinclair, G., transmission and reception of elliptically polarized waves 1341
Singer, F. J., military teletypewriter systems of second world war, 2621
Singer, S. F., with others, geomagnetic field strength at great altitudes, 2497
Singh, R. N., with S. S. Banerjee, morning fading of s.w. signals and thermal F_2-layer expansion, 440
Singleton, H. E., digital electronic correlator, (A)1441
Sirkar, S. C., and S. N. Sen, u.h.f. absorption in organic liquids, 609
Skalnik, J. G., pulse-controlled thyratron, 784
Skudrzyk, E., ultrasonic vibrations, 1323
Slater, J. C., Lorentz correction for $BaTiO_3$, 2188
Slätis, H., and K. Siegbahn, magnetic lens, 200
Slaymaker, F. H., loudspeakers, (A)1319
—— with others, acoustical impedance of loudspeaker housings, 1851
Sletten, C. J., with others, correction of spherical aberration by phased line source, 2713
Slinkman, R. W., frequency-control valve, (A)1554, 2939; temperature-limited noise diode design, 500
Sloan, G. H., with others, effective phase, group, and pulse velocities of wave propagation, (A)1482
Slonczewski, T., with W. J. Means, automatic calibration of oscillator scales, 2825
Slootmakers, P., with A. van Itterbeek, ultrasonic absorption in water and in salt solution, 528
Slutz, R. J., design of diode gate circuits, (A)1441
Smeby, L. C., theory of short aerials, 35
Smit, N. W., and F. A. Kröger, luminescence of ZnS-Pb, 110
—— with F. A. Kröger, formation of fluorescence centres in ZnS-Cu, 2229
—— with others, fluorescence of ZnS-Cu, 1425
Smith, A. W., Electrical Measurements in Theory and Application, (B)2297
Smith, B. H., and W. T. Selsted, loudspeaker for 5–20 kc/s, 806
Smith, C. E., Communication Circuit Fundamentals, (B)1891
Smith, E. D., construction of helical aerials, 1063
Smith, E. H. Frost, effect of supply frequency on performance of magnetic amplifiers, 44, (D)563
Smith, E. J., with others, problem of the magnetic amplifier, 2729
Smith, E. K., measurement of voltage drop across gas-filled valves, 2291
Smith, F. G., galactic radiation, (A)856
Smith, F. W., with R. F. Guy, experimental u.h.f. television station, (A)1534
—— with others, u.h.f. television station KC2XAK, Bridgeport, 1795
Smith, H. W., with A. W. Straiton, drift of microwave fluctuations on overwater path, 2876
—— with others, microwave signal strength, phase, and index of refraction, 1483
Smith, J. J., and P. L. Alger, justification of Heaviside methods, (A)1182
Smith, L., photoconductivity and photoemission of semiconductors, (A)668
Smith, N. R. Parker, television gain control by black-level monitoring, 2358
Smith, N. S., h.f. broadcasting in Australia, 746
Smith, O. J. M., thermistors, dynamic characteristics of, 2143; static characteristics of, 2142
Smith, P. H., r.f. transmission-line abacs, 808
Smith, R. A., Aerials for Metre and Decimetre Wavelengths, (B)822; physics research at T.R.E., 3217
Smith, R. N., with others, Si and Ge rectifiers, theory of, 1941
Smith, R. S., with M. J. Klein, theory of magnetization of thin ferromagnetic films, (A)2486
Smith, S. B., and K. W. Tremellen, very-low-frequency propagation (A)1498
Smith, S. E., with W. J. Kessler, atmospheric waveform receiver, (A)1501
Smith-Rose, R. L., solar noise and ionospheric fading, 1238; velocity of radio waves, 1484
Smolenski, G. A., ferroelectric properties of titanates and zirconates, 2548
Smoliar, G., with others, c.r. tube e.s. memory system, 2005
Smyth, J. B., with M. D. Rocco, diffraction of h.f. radio waves, 203
Snoddy, L. B., with G. W. Clark, production of high-current pulses with resonant-cavity accelerator, (A)2591
Snoek, J. L., with L. J. Dijkstra, propagation of large Barkhausen discontinuities in Ni-Fe alloys, 1903
Snow, C., potential and capacitance of conductor bounded by two intersecting spheres, 880
Snyder, C. L., E. Albers-Schoenberg and H. A. Goldsmith, ferrites, 659
Soderstrom, H. W., and K. H. McPhee, metal/ceramic seal for high-temperature applications, (A)1554
Sogn, L. T., loading quartz crystals to improve performance, 2161
—— and W. J. Howard, production of very thin quartz plates, 1178
Sokoloff, B. A., O.M.E. III calculating machine, 1950
Soldi, M., method of nodal equations for linear-network problems, 1096; phase-shift oscillators with very tight coupling, 587
Solow, M., v.h.f. electrodynamic ammeter, 2832
—— with F. M. Greene, v.h.f. field-strength standards, 3090
Soltes, A. S., beam-deflection nonlinear tube, Type QK-256, 2940
Somers, H., interference effects, and their correction, in television synchronization, 3180
Somerville, T., and S. F. Brownless, listeners' sound-level preferences, 2118
Sommer, A., and W. E. Turk, high-sensitivity multiplier photocells, 2085
Sommerfeld, A., Partial Differential Equations in Physics, (B)2821
Sonkin, S., with others, development of 10-cm high-power pulsed klystron, (A)1554
Sonnenschein, A. H., and H. A. Finke, mode suppression in broad-band reflex-klystron oscillators, (A)1355
Sorrows, H. E., with R. C. Ellenwood, cathode-heater compensation for stabilized d.c. power supplies, 468, 1779
Southey, R. V., modern practice in disk recording, 540
Southgate, S., with J. D. Storer, receiving aerial comparator and monitor unit, 1238
Southworth, G. C., principles and applications of waveguide transmission, 2973
Sowton, C. W., with F. Hollinghurst, v.h.f. point-to-point communication, (D)1521
Spahn, E., Sauter remote-control system, 1744
Spangenberg, K. R., with F. W. Schott, analogue analysis of losses in reflex cavity resonators, 584
Spaulding, F. E., Jr, and R. L. Rod, direct-reading loran indicator, 1160
Spence, R. D., with A. Leitner, effect of ground plane on radiation from $\lambda/4$ dipole, (A)2423; oblate spheroidal wave functions, 2259
Spencer, J., operation and care of circular-scale instruments, 146, 402
Spencer, J. G., with others, electrical noise measurement, 989
Spencer, R. C., C. J. Sletten and J. E. Walsh, correction of spherical aberration by phased line source, 2713
Spenke, E., with F. Rose, easy-flow characteristics of Cu_2O rectifiers, 755
Spiegel, G., sensitivity of galvanometers, 151
Sponder, E., stability conditions and Hurwitz determinants, 2433
Spreadbury, F. G., Permanent Magnets, (B)340
Sprenger, K., with E. Lauter, sky-wave observations during auroral displays in 1947, 728
Springer, P. W., end-loaded and expanding helices as wide-band circular-polarization aerials, 2715
Sprinkle, M. C., with D. Sarser, musician's amplifier, 70
Sreekantan, B. V., with S. K. Chatterjee, electron transit time in negative-grid oscillators, 1820, 3002; u.h.f. absorption and reflection by sea water, 1904
Staal, C. J. H. A., multiplex p.m. equipment, 2025
Stahl, F. A., with B. J. Rothlein, photoelectric effects in Ge, 1924
Stambaugh, R. B., with A. S. Ostroski, emulsion polymerization with ultrasonic vibrations, 2583
Stanesby, H., survey of modern valves, 482
—— and W. K. Weston, London/Birmingham television cable, 276
Stanier, H. M., radiation distribution from undisturbed sun at λ 60 cm, 1401
Stanley, G. J., with J. G. Bolton, galactic r.f. source Taurus-A, 887
Stark, K. H., equivalence of temperature and frequency in dielectric measurements, 3022
Starkey, B. J., and E. Fitch, mutual- and self-impedance of coupled parallel aerials, 2136
Staton, M. G., microwave relay communication system, 2347
Staub, H. H., with B. B. Rossi, Ionization Chambers and Counters, Experimental Techniques, (B)2605
Stawski, H. W., with A. A. Pascucci, frequency-doubling by means of titanate capacitors, 1384
Steckelmacher, W., and S. van der Meer, automatic control of thermionic emission, 2849
Steele, F. G., with A. E. Wolfe, Jr, direct-reading timer and clock, 391
Steiger, J., new valves, 1289
Stein, W. A., magnetic properties of stainless steels, 2527
Steinberg, E. B., variable-frequency power supply unit, 245
Steinberg, J. L., theory of semi-distributed amplifiers, 1635
—— with J. Mosnier, output-voltage fluctuations in radio-noise receiver, 1239
Steinmann, W., planning of radio relays, 3160
Stel, M., and E. C. Witsenburg, h.f. dielectric heating, 2854
Stenbeck, W. G., with others, dielectric constant of a ferromagnetic ferrite, 1932
Stenzel, A., measurement of field distribution, 395
Stenzel, H., compensators for beam aerial arrays, 1868; measurement of small angles of elevation for incoming metre waves, 3130
Sterling, H. T., cathode follower as a.f. power amplifier, 599; simplified preamplifier design, 72
Stevels, J. M., power factor of glasses as function of composition, 3075
Stevens, L. D., with J. H. Knapton, gate-type shifting register, 675
Stevens, S. S., with J. E. Hawkins, Jr, masking of pure tones and speech by white noise, 1063
Stöckmann, F., electrical conduction in semiconductors, 2248
Stone, J. E., ultra-low-frequency oscillator, 0·1–0·02 c/s, 968
Stone, O., electron-injection gun for M.I.T. 350-MeV synchrotron, (A)2596
Storch, L., design of π-network aerial couplers, 571, (C)1363
Storer, J. D., operating conditions for cathode-coupled flip-flops, (D)1106
—— and S. Southgate, receiving-aerial comparator and monitor unit, 1238
Storm, J. F., computer for solving secular equations, 2812
Storruste, A., and H. Wergeland, diffraction of sound waves by circular disk and aperture, 2114
Story, J. T., audiometer Type TF805, 890
Strait, E. N., and W. W. Buechner, photocell input impedance for voltage stabilizer, 1013
Straiton, A. W., and A. H. LaGrone, angular separation of direct and reflected 3·2-cm waves, 2016; modified refractive index over Gulf of Mexico deduced from radio data, 2773
—— and H. W. Smith, drift of microwave fluctuations on overwater path, 2876
—— A. H. LaGrone and H. W. Smith, microwave signal strength, phase, and index of refraction, 1483
—— with A. H. LaGrone, optimum aerial for reception of 3·2-cm signals over 27-mile desert path, 731
Strans, D., fade-out statistics for 1948 and sunspot data, 3146; sporadic-E clouds at 125 km height during auroral display, 3046
—— with O. E. H. Rydbeck, ionospheric effects of solar flares, 1948, 619
Straus, H. A., with P. R. Bell, electronic pile simulator, 3062
Strecker, F., stability testing by means of circle diagrams, 825, 2967
Street, R., and J. C. Woolley, magnetic viscosity in Mn-Zn ferrite, 373; time decrease of magnetic permeability in alnico, 2483
Stroh, W. J., simplified intercarrier television sound system, 1784
—— with R. O. Gray, uses of 6BN6 beam valve in television, 1785
Strübig, H., with others, television developments by Fernseh G.m.b.H., 1930–1945, 2908
Strum, P. D., J. W. Kearney and J. C. Greene, theory and applications

of Si crystals for microwave mixing and harmonic generation, (A)1355
—— with M. T. Lebenbaum, low-noise-figure microwave receiver design, (A)1501
Strutt, M., modern methods of electrical power amplification, 2457
Studer, F. J., and G. R. Fonda, optical properties of $CaSiO_3$ phosphors, 107
Stuetzer, O. M., high-impedance 'fieldistor' crystal amplifier, 3198; microspaced-electrode technique, 3068
Sturley, K. R., push-pull a.f. amplifiers, 1118
Stutt, C. A., with Y. W. Lee, statistical prediction of noise, 2755
Suart, R., miniature receiving valves, 1030; technology of u.h.f. valves, 2096
van Suchtelen, H., with W. G. Perdok, detection of piezoelectricity of crystal fragments, 1966
—— with others, Applications of the Electronic Valve in Receiving Sets and Amplifiers, (B)991
Sueur, R., line impedance matching for long-distance telephony equipment, 1766; transistron triode Type PTT601, 789; 15th plenary session of C.C.I.F., Paris, 1949, 994
—— and others, quartz and its use in telecommunications, 1706
Sullinger, W. R., with J. Z. Millar, New York/Philadelphia microwave television relay, 1523
Sultanoff, M., 10^6-frame/sec camera, 3178
Sulzer, P. G., frequency and amplitude stability of cathode-coupled oscillator, 1884; v.h.f. match meter, 2837
Surman, W. L., new design of Wheatstone bridge, 941
Sussman, H., and S. L. Ehrlich, magnetostriction properties of hiperco, 2790
Sutton, R. B., with E. Pearlstein, mobility of electrons and holes in diamond, 3123; phenomena in diamond γ-ray counters, (A)2602
Swaffield, J., and R. H. de Wardt, reference telephone system for articulation tests, 1848
—— with R. J. Halsey, analysis-synthesis telephony and the vocoder, (D)457
Swann, W. F. G., fluctuations in proportional counters, 1466; theory of electrets, 2187
Sweeney, J. H., use of Ge diodes, at h.f., 1791, in u.h.f. television receivers 1543
Sweet, P. A., solar general magnetic field, 1677
Swoboda, G., telemetry technique, 2301
Swope, I. G., with others, operation of M.I.T. 350-MeV synchrotron (A)2595
Symonds, G. W., with others, voice-operated switching for carrier systems, 1243
Szabó, G., ratio of electrical to friction torques in indicating instruments 149
Sze-Hou Chang. See Chang, Sze-Hou.
Szendrei, M. E., with J. A. Gledhill, theory of production of ionized layer in non-isothermal atmosphere, 2211
Szepesi, Z., ring mode filter for Type H_{11} waves in circular waveguides, 2420
Szigeti, B., dielectric constant of ionic crystals, 381

T

Ta-You Wu. See Wu, Ta-You.
Taeger, W., bridged-T network and its properties, 2446; effect of resistive damping on phase shift in lattice networks, 1618; resistance quadripoles as attenuator elements, 578; theory of relaxation oscillations, 2995
Taft, V. A., construction of networks with given frequency characteristics, 1878
Tai, C. T., theory of biconical aerials, 816
Tait, A., with others, source of error in radio phase-measurement systems, 2515
Tamarkin, P., underwater scattering of ultrasonic beam by liquid cylinder, 529
Tanasescu, T., impedance of free space, (D)1397
Tapson, M. E., television interference suppression in 14-Mc/s transmitter, 2661
Tayler, N. H., marginal checking as aid to computer reliability, (A)1441
Taylor, A. H., thermistor thermostats, 2586
Taylor, D., electronic instrumentation in atomic research, (A)1998
Taylor, R., R. Bechmann and A. C. Lynch, piezoelectric crystals for filters, 116
Taylor, W. E., and H. Y. Fan, high-resistance barriers at crystal boundaries in Ge, (A)1940
Teare, B. R., Jr, with others, theory of band-pass analogy, 61
Teasdale, R. D., and H. J. Higgins, e.m. waves in circular waveguides containing two coaxial media, 2707
Teegan, J. A., London University research in physics, atmospherics and semiconductors, 2216
Telecommunications Research Establishment, Measurements Division, with W. H. Ward, R.A.F. calibration centre, 1186
Telfer, J. E., a.f. equipment for broadcasting services, 2027, 3171
Tellegen, B. D. H., synthesis of passive resistanceless quadripoles, 1879
Terroni, T. B. D., 12-channel carrier-telephony system, 2891
Terry, P. R., variable-disk-speed method of measuring pickup response, 275
Teunissen, H. A., class-B modulators for high-power transmitters, 490
Thaler, W. J., with J. A. Fitzpatrick, $BaTiO_3$ coaxial capacitor for production of short-duration spark, (A)2604
Thali, H., Technical Dictionary, German-English-French, (B)1046
Thatcher, J. W., with J. R. Whitney, noise reduction by use of delay networks, 1855
Theile, R., h.f. oscillography, 405
Theissen, E., ionosphere F_2-layer parabolic-model data, 2775
Thibieroz, L., and H. Saucet, manufacture of French miniature valves, 1802
Thiede, H., ultrasonic apparatus for therapy, 2398
Thirion, E., electronic control of resistance welding, 958
Thomas, A. B., stagger-tuned i.f. amplifier design, 3009
Thomas, H. A., industrial electronic applications, (D)424
Thomas, J. E., Jr, with others, operation of M.I.T. 350-MeV synchrotron, (A)2595
Thomas, J. L., and others, absolute measurement of resistance, 932
Thomas, L. A., with J. L. Rycroft, salvaging electrically twinned quartz, 376
Thomasson, D. W., operating conditions for cathode-coupled flip-flops, (D)1106; output impedance control, (D)1336
Thompson, B. V., with R. A. Hampshire, ILS-2 instrument landing system, 2513
Thompson, P. O., with others, frequency selectivity of ear, 2692
Thompson, S. P., reciprocity calibration of transducers, 14
Thomsen, S. M., sulphide in ZnO luminophors, 2523
Thomson, W. E., delay networks with maximally flat characteristics, 310; stagger-tuned low-pass amplifiers, 1114
Thourel, L., sound transmitter for Eiffel Tower television station, 1540
Thynell, G. M., with P. A. Borden, Principles and Methods of Telemetering, (B)1746
Tiberio, C. A., with others, F_2-layer critical-frequency recordings, Rome, Sept. 1948–March 1949, 1684
Tice, T. E., and J. D. Kraus, helical beam-aerials, 283
Tillotson, J. H., with W. W. Harman, beam-loading in small reflex klystrons, 787
Tischer, F., impedance measurement with microwaves, 3093
Tisdale, G. E., continuously adjustable electronic filters, 2739
Toal, E. P., sales attitude towards industrial design, (A)1559
Todd, W., blocking oscillator for telemetry, (A)1355
Toll, J., with others, linear preamplifier for use with long coaxial cable, 3013
Tombs, D. M., simple wave analyser, 2573
—— with M. F. McKenna, amplifier with negative-resistance load, 2170
—— with P. Bura, resonant circuit with periodically variable resistor, 3001
Tomek, F., 'summadyne' principle for superheterodynes, 230
Tomiyasu, K., aerials and open-wire lines, 399; effects of bends on 2-wire transmission line, 2418; loading effects of standing-wave detectors, 691; unbalanced termination of shielded-pair line, 2417
—— with R. King, terminal impedance and generalized 2-wire-line theory, 28
Tomlinson, T. B., synchronization for long-range television reception, 1786
Tonner, J. S. A., long electron beam in axial magnetic field, 2376
Toporeck, B. E., and F. M. Ashbrook, rockets range instrumentation, (A)1467
Toraldo di Francia, G., critical review of diffraction theory, 345; reflection coefficient of potential barrier, 1894
Torgow, E. N., with H. J. Carlin, microwave attenuators for powers up to 1000 W, 2843
Torsch, C. E., c.r.-tube sweep transformer with ceramic/iron core, 2916
Toulon, P. M. G., high-intensity pulse-distribution tube, (A)1554
Townsend, R., effect of valve impedance on phase-shift oscillators, (D)1096
[illegible], H. M., telephony research in South Africa, 2341; transmission aspects of telephone instrument, 2342
Trébuchon, G., tropicalization of materials for valve manufacture, 1433, 2244
—— and J. Kieffer, physics of glass/metal sealing, 2253
Tremellen, K. W., with S. B. Smith, very-low-frequency propagation, (A)1493
Trewman, H. F., Electronics in the Factory, (B)435
Trillat, J. J., and S. Oketani, electron-diffraction apparatus for investigating insulator surfaces, 3107
Trolese, L. G., with J. P. Day, s.w. propagation over desert terrain, 1492
Trost, A., operation of counter tubes, 3120
Truell, R., measurement of strength of h.f. e.m. fields, 139
Truesdell, C., effect of earth's compressibility on its magnetic field, 2209
Trunova, N. V., high-efficiency amplification of modulated oscillations, 1385
Tschäppät, O., electrolytic iron, 382
Tschu, K. K., practical determination of daily variations of geophysical data, 696
Tschudi, E. W., admittance and transfer functions for π-mesh RC filter network, 1622; transfer abacs for low-pass iterative filters, 576
Tuck, J. L., with T. R. Kaiser, electron capture and phase stability in 14-MeV synchrotron, 961
Tucker, D. G., detuned resonant circuits, (D)1374; frequency changers and constant-gain amplifiers, 297; modulators with nonlinear inductors and capacitors, 478; rectifier modulators, with frequency-selective terminations, 260, (D)2371, without transformers, 1632
—— and E. Jeynes, nonlinear effects in rectifier modulators, (D)1552
Tung Chang Chen, Ge-diode coincidence and mixing circuits in digital computers, 1958
Tung, T. P., with V. C. Rideout, analysis and design of band-pass distributed amplifier, (A)1355
Tunnicliffe, P. R., with I. L. Fowler, BF_3-filled proportional counters, 3127
Turk, W. E., with A. Sommer, high-sensitivity multiplier photocells, [illegible]
Turnbull, J. C., with A. S. Rose, tests of Cr/Fe alloys for cones of c.r. tubes, 1181
Turner, A. H., artificial lines for video distribution and delay, 1269
Turner, L. A., with others, Radar Scanners and Radomes, (B)651
Turner, R. R., common-frequency carrier-shift radio-teletype converter, (A)1501
Twersky, V., non-specular reflection of sound, (A)1841
Tyminski, W. V., wide-band chain amplifier for television, 2048
Tyrrell, A. J., performance and stability of permanent magnets, 2251
Tyson, O. A., simplified microwave frequency stabilization, 778

U

Underhill, B. B., ionospheric research at Pennsylvania State College, (A)631
Underhill, G. H., frequency allocations for mobile systems, 742
Ungvary, R. L., with H. J. Reich, transistor trigger circuit, 53
Untermann, G., u.h.f. measurement on semiconductors by the concentric-line method, 3087
Urick, R. J., with B. D. Simmons, plane-wave reciprocity parameter and transducer calibration, 531
Usan, R., with G. Mesnard, preparation of thoria cathodes by cataphoresis, 2069

V

Vackář, J., LC oscillators and their frequency stability, 2450
Vale, J., with others, operation of the 184-in. cyclotron, [illegible]
Valentin, F., detection of light pulses using electron-multiplier photocell, 3114
Valeton, J. J. P., with J. Haantjes, projection television, 2643
Valko, G., with P. Güttinger, comparison of common-carrier and multiple-carrier multichannel systems, 3157
Valladas, G., electronic apparatus used for particle detection, 3122
Vallarino, A. R., c.r.o. presentation of time delay and distortion in wide-band f.m. systems, (A)1454
del Valle, G. A., portable projector for 16-mm sound or silent film, 545
Vallese, L., input and output admittances of linear amplifiers, 1116
Vallese, L. M., density distribution of transient currents in conductors, 1900
Van Bronkhorst, A., with others, fringe fields of ferromagnetic domains, 1212
Van Duyne, J., measurement of transient response of television receivers, 1194
Van Lancker, M., theory and design of m.f. electric furnaces, 3112
Van Meter, J. L., with H. J. Dana, pin-pointing ultrasonic energy, 1561, 2685
Van Scoyoc, J. N., and G. F. Warnke, d.c. amplifier with cross-coupled input circuit, 1122; 24-channel c.r.-tube recorder, 2853
—— with D. H. Pickens, phase-shift band-pass filters, 1881
Van Wambeck, S. H., and A. H. Ross, diversity-reception techniques, (A)1501
—— with J. L. Glaser, tests of diversity receiving systems, (A)1501
Varney, L., television interference suppression, 1547
Vasseur, J. P., diffraction of e.m. waves by plane conducting screen, 85
Vassos, J., evolution and growth of industrial designing, (A)1559
Vaughan, W. C., phase-shift oscillator, 324, (C)1628
Vautier, R., with others, magnetic properties of a Co ferrite, 1168
Vawter, F., with others, radar reflections from auroras, 1688
Vazaca, C., skin effect, 86
Vazsonyi, A., generalization of Nyquist's stability criteria, 293
van der Velden, H. A., and G. P. Freeman, influence of red and infrared light on diamond crystal counter, 3124
—— with G. P. Freeman, photoelectric properties of diamond, 3055
Veldkamp, J., with J. Bartels, international data on magnetic disturbances, second quarter 1949, 1140, fourth quarter 1949, 2498
Veronda, C., and V. Learned, recent development in high-power klystron amplifiers, (A)1554
Versnel, A., with K. S. Knol, suppression of shot-effect noise in triodes and pentodes, 516
Verster, N. F., electronic current regulator, 1589; magnetic-lens-type β-ray spectrometer, 1466
Vertsner, V. N., electron gun for electron microscope, 964
Vidal, P., semiconductor properties of deep-quarried chalk, 2249
Vienne, —, and — Scotto, 'pipology', radar operating technique, 2219
Vilbig, F., devices for speech frequency analysis and compression, 2693
Villard, O. G., Jr, with others, meteor-trail echo study of winds in upper atmosphere, 3052
Ville, J., analytical signals with limited spectra, 1020
—— with P. Herreng, pulse-echo method for impedance irregularities of coaxial cables, 2278
Villem, R., applications of quartz crystals, 3110
Vink, H. J., with R. Loosjes, oxide cathodes, conduction processes in, 2984, electron emission and conduction mechanism of, 491, 3208, potential distribution during pulses of great current density, 1302
—— with others, potential distribution in pulsed oxide cathodes, 2067
Viol, F. O., disk recording for broadcasting, 541, 1569
Violet, F., and J. Riethmuller experimental investigation of oxide cathodes, 2330
Vodar, B., and N. Mostovetch, variation of resistance of thin metal films with applied potential, 2535
—— with N. Mostovetch, resistance of thin metal layers at low temperatures, 1701
Vodden, H. A., thermostat control unit, 2031
Voge, J. P., multiplex telephony systems and radio links, 1522
Vogel, T., vibration of metal plate in sound field, 528
Völcker, E., piezoelectric acceleration meter, 413
Volkers, W. K., ultra-high-gain direct-coupled amplifier circuits, (A)1355
Voorhees, L., low-power television transmitter, 1270
Voorhies, H. G., particle injection into accelerators, 1471
Vormer, J. J., piezoelectric elements in telecommunications technique, 2525
Vousden, P., with H. F. Kay, symmetry changes in $BaTiO_3$ at low temperatures, 374

W

Wachtel, I. S., with G. R. White, true heights of F_2 layer, 629
Wadley, T. L., single-band 0–20-Mc/s ionosphere recorder, 392
Wagner, J. L., and W. Webb, carrier frequency for remote timing control, 2300
Wagner, K. W., Einführung in die Lehre von den Schwingungen und Wellen, (B)882
Waidelich, D. L., response of circuits to repeated pulses, 561
Wakefield, K. E., magnetic-fluid clutch, 969
Wakeman, R. P., WTTG field-strength survey, 2050
Wakerling, R. K., with A. Guthrie, Vacuum Equipment and Techniques, (B)1945
Waldmeier, M., final relative sunspot numbers for 1949, 2494; provisional sunspot numbers, April–June 1949, 618, July–Sept. 1949, 1138. Jan.–March 1950, 2495
Walford, H. E., with others, extraction of electron beam from 30-MeV synchrotron, 2857
Walker, A. C., and E. Buehler, production of large quartz crystals, 2796
Walker, A. H. B., metal-rectifier voltage multipliers for h.v. supplies, [illegible]
Walker, D. C., D. L. Richards and G. P. Horton, square-law rectifier circuits for meters, 3096
Walker, J. N., band-switch QRO transmitter, 1283
Walker, R. C., with others, Outline of Radio, Television and Radar, (B)2954
Walker, R. M., analogue computer for linear simultaneous equations, 673
Wallace, S. C., installation of radio instruments in aircraft, 752
Wallauschek, R., measurements on travelling-wave amplifiers, 2062
—— with M. Jessel, propagation along helical delay line, 1859
Wallman, H., electronic integral-transform computer, 2811
Wallmark, J. T., experimental valve using space-charge deflection of the electron beam, (A)1554
Walsh, J. E., radiation patterns of circular and cylindrical arrays, (A)1338
—— with others, correction of spherical aberration by phased line source, 2712
Walter, F., physical principles of dielectric heating of nonconductors, 954
Walter, W. Grey, electronic instruments in diagnostic medicine, (D)2588
Wang, An, magnetic triggers, 2437; static magnetic pulse control and information storage, (A)1441
—— and Way Dong Woo, static magnetic storage and delay line, 1183
—— with J. L. Rothery, hysteresis asymmetry for Ni/Fe alloy, 862
Wang, C. C., electron beams in axially symmetrical e.m. and e.s. fields, 1395
Ward, E. E., feedback amplifiers and servo systems, 2175
Ward, J., with others, automatic exposure control for aerial photography and television, 1999
Ward, J. C., quantum effects in the interaction of electrons with h.f. fields, 3196
Ward, L., phase conditions for various permanent-magnet alloys, [illegible]
Ward, W. H., direct-reading dm-λ impedance meter, 2286
—— and T.R.E. Measurements Division Staff, R.A.F. calibration centre, 1186
de Wardt, R. H., with J. Swaffield, reference telephone system for articulation tests, 1848
Ware, L. A., and H. R. Reed, Communication Circuits, (B)1650
Warnecke, R., O. Doehler and W. Kleen, amplification by interaction between electron beams, 333
—— and others, electron bunching in v.m. valve, 510; magnetron-type travelling-wave amplifier, 2064
Warner, H. P., with J. E. McCoy, theatre television, 349
Warnke, G. F., with J. N. Van Scoyoc, d.c. amplifier with cross-coupled input circuit, 1122; 24-channel c.r.-tube recorder, 2853
Warriner, B., 1000-Mc/s crystal-controlled airborne transmitter for distance-measuring equipment, (A)1416
Washburne, R. D., infrared-image-converter tube, 193
Wathen-Dunn, W., reciprocity free-field calibration of microphones, 19
Watkinson, E., universal coil winding, 2993
Watson, H. H. H., with others, λ/4 coaxial-line resonators for betatron-started synchrotrons, 430
Watson, R. B., and C. W. Horton, diffraction of radar wave by conducting wedge, 3136
—— with C. W. Horton, diffraction of cm waves by semi-infinite screen, [illegible]
—— with O. E. Kruse, a.f. phase meter, 1190
Watson, S. N., with others, television of 1950 Oxford and Cambridge boat race, 2906
Watts, J. M., with J. N. Brown, ionosphere observations at 50 kc/s, 2506
—— with others, 600-Ω multiwire Δ aerial for ionosphere recorders, 2675
Watts, R. J., asymmetrical pulse-duration modulation, 230; quenching circuit for G-M counter with negative h.v. supply, 179
Wayman, P. A., with E. H. Linfoot, aberrations of field-flattened Schmidt camera, 1655
Waymouth, J. F., Jr, oxide cathodes operated at low duty factor, (A)[illegible]
Waynick, A. H., summary of Pennsylvania State College Conference symposia, (AD)637
—— with J. A. Wenzel, microphony in planar triode, 2094
Weale, R. A., resistivity of thin metal films, 1175, 1430, (D)1431
Weatherley, W. C., comparison impedance bridge for 40–270 Mc/s, 156
Webb, M., and others, dimensional tolerances in c.r. tube guns, 2941
Webb, R. C., and J. M. Morgan, industrial television system, (A)1467, 235
Webb, W., with J. L. Wagner, carrier frequency for remote timing control, 2300
Webber, S. E., 1-kW travelling-wave valve, 2378
Weber, E., with others, problem of the magnetic amplifier, 2729
Weber, K. H. R., conditional stability of feedback amplifiers, 862
Weber, P. E., diaphragm-type infrared radiometer, 2847
Webster, F. A., with I. J. Hirsh, interaural phase effects on binaura threshold, 11
Weekes, K., effect of sudden ionospheric disturbance on oblique reflections of long waves, 2326; formation of the ionized regions, (A)1406; ground interference pattern of 16-kc/s waves, 1491; observations at Cambridge on radio fade-outs, (A)1498
van Weel, A., noise level in f.m. radio relay links for carrier telephony, 1006
Wehe, H. G., metallizing paper for capacitors, 123
Wehner, G., u.h.f. plasma oscillator, 1108
Wei, Ming-Yi, with R. T. Beyer, theory of magnetic amplifiers, 278
Weil, L., anomaly of length in ferrites, 2533
—— F. Bertaut and L. Bochirol, magnetic properties of Cu ferrite, 278
—— M. Gallay and P. Poensin, magnetostriction measurement with strain gauge, 2492
—— S. Marfoure and F. Bertaut, thermal variation of coercive field o powdered cobalt, 2235
Weill, J., measurement of radioactive radiations, 3109
Weimer, P. K., image isocon television camera, 347; photoconductivity o amorphous Se, 2519
—— S. V. Forgue and R. R. Goodrich, Vidicon photoconductive televisio pickup tube, (A)1534, 2040
Weinert, K. F., screening in electrical communication apparatus, [illegible]
Weingartner, H. L., design of high-vacuum plant, [illegible]
Weinreich, O. A., activation of thoria cathodes, 1800; thermal emissivity of thoria filaments, (A)[illegible]
Weinstein, L. A., sound vibrations in open tubes, 4; theory of shot effect 515
Weissfloch, A., impedance measurements for dm and cm waves, [illegible] theory of systems with transmission-line coupling, 818
Welker, H., theory of Hall effect in composite conductors, 3028
Wells, H. W., sunrise effects in F layer, [illegible]
Went, J. J., physical relations for ternary Ni/Fe alloys, 657
Wenzel, J. A., and A. H. Waynick, microphony in planar triode, 20
Wenzl, F., plasma and the Langmuir layer, 1657
Wergeland, H., with A. Storruste, diffraction of sound waves by circula disk and aperture, 2114
[illegible], F. D., with L. Camp, low-Q directional transducer, (C)[illegible]

West, J. C., Nyquist's criterion of stability, **1870**
West, J. L., with L. H. O'Neill, direct-reading phase meter, **(A)1454, 2289**
Westberg, V., and M. Chodorow, space-charge effects in reflex klystrons, **(A)1554**
Westervelt, P. J., pressure and velocity in plane acoustic wave, **2396**
—— with others, pulse statistics analysis of room acoustics, **2406**
Westfold, K. C., e.m. wave propagation in ionized medium, **976**
—— with J. C. Jaeger, transients in ionized medium and solar noise, **1678**
Weston, W. K., with H. Stanesby, London/Birmingham television cable, **276**
Westöö, R., and T. Wiedling, pulse distribution in R.C.A. 931A multiplier photocell, **2056**
de Wet, J. S., and F. Mandl, asymptotic distribution of eigenvalues, **1133**
Whalley, W. B., simplification of television receivers, **1271**
Whatman, A. B., $h'f$ records at Spitsbergen, **(A)1415**
Wheeler, D. J., programme organization and initial orders for EDSAC **3083**
Wheeler, H. A., limitations of small aerials, **553**
Wheeler, M. S., frequency contours for microwave oscillator with resonant load, **317**
Whelan, F. G., with C. F. Miller, measurement of dielectric constant and dissipation factor, **(A)2277**
Whiffen, D. H., microwave absorption, of non-polar liquids, **1669**, of polar substances in non-polar solvents, **1670**
White, A. H., thermodynamics and the oxide cathode, **493**
White, G. R., and I. S. Wachtel, true heights of F_2 layer, **629**
White, P. E. P., with others, u.h.f. test oscillator using buzzer, **2581**
White, R. W., valves for 30–3000 Mc/s, **3201**
—— with J. H. H. Merriman, f.m. v.h.f. multichannel R/T, **(D)1516**
—— with others, London/Castleton experimental radio-relay system, **3169**
White, W. C., positive-ion emission, **3074**; 'tron' glossary, **2107**
—— and H. W. Lord, reciprocator, **66**
White, W. D., theory of asynchronous multiplex systems, **1767**
Whitehead, J. B., and W. Rueggeberg, dielectric loss with changing temperature, **(A)187**
Whiteley, A. L., electronics in war and peace, **(A)191**
Whiteman, R. A., coupling circuits for h.f. heating, **186**
Whitney, J. R., and J. W. Thatcher, noise reduction by use of delay networks, **1855**
Whitwell, A. L., electronics in aircraft design, **1736**
Wholey, W. B., and W. N. Eldred, new type of slotted-line section, **1587**
Wick, C. H., automatic induction surface hardening, **953**
Widell, E. G., and R. A. Hellar, electron emission of oxide cathodes, **(A)1436**
Wiedling, T., with R. Westöö, pulse distribution in R.C.A. 931A multiplier photocell, **2056**
Wiener, F. M., diffraction of sound by rigid disks and square plates, **(C)1063**
Wiener, N., The Extrapolation, Interpolation and Smoothing of Stationary Time Series, with Engineering Applications, **(B)2465**
Wiesner, J. B., statistical theory of communication, **2888**
—— and Y. W. Lee, determination of system functions by correlation, **(A)1441**
—— with Y. W. Lee, correlation functions and communication applications, **2262**
—— with others, sound-system design for reverberant auditoria, **(A)1319**
Wigan, E. R., network theorem, **305**
Wigington, L. M., with L. J. Anderson, bantam microphone, Type KB-2C, **805, 1850**; microphone with improved noise rejection, **1567**
Wigner, E. P., with E. T. Jaynes, electronic theory of ferroelectrics, **(A)2474**
Wilde, H., magnetic after-effect in Si-Fe and Ni-Fe laminations, **904**
Wilder, M. P., electrodes for valves by photogravure, **488**
Wilford, S., with W. C. Michels, emissivity and resistivity of Ti, **1177**
Wilhelm, H. T., performance measurement of capacitors, **(A)1454**
Wilkes, M. V., Oscillations of the Earth's Atmosphere, **(B)2217**
—— and W. Renwick, EDSAC calculating machine, **917**
Wilkins, J. J., betatron-starting in electron synchrotrons, **1789**; design of synchrotron pole-faces, **1473**
—— with others, $\lambda/4$ coaxial-line resonators for betatron-started synchrotrons, **430**
Wilkinson, D. H., stabilizer for proportional counters, **1199**
Willard, D., and C. G. Montgomery, measurement of spurious counts in G-M counters, **2862**
Willardson, R. K., and G. C. Danielson, effect of light on diamond counter, **1202**
Willenbrock, F. K., and S. P. Cooke, interaction of spiral electron beam and resonant cavity, **1626**
Williams, A. J., Jr, W. G. Amey and W. McAdam, stabilization of wide-band d.c. amplifier, **(A)596**
Williams, C., effects of sky wave on operation of l.f. navigation aids, **(A)1489**
Williams, E. M., D. F. Aldrich and J. B. Woodford, speed of electronic switching circuits, **1353**
—— with G. M. Anderson, transient response to asymmetrical carrier systems, **(A)1511**
—— with E. R. Schatz, exponential-line pulse transformer, **(A)1355**
—— with others, theory of band-pass/low-pass analogy, **61**
Williams, F. C., and S. W. Noble, limitations of magnetic modulator for amplification of small d.c. signals, **(A)1599**
—— with others, fast multiplying circuit, **(A)2558**
Williams, F. E., interpretation of luminescence phenomena, **103**
—— with J. H. Crawford, Jr, properties of ZnF_2 and ZnF_2-Mn, **2792**
Williams, G. W., with others, field stabilization for large electromagnet, **1531**
Williams, M. C., with others, r.f. detection with CbN superconductor, **223**
Williams, P. D., contaminants in valves, **(A)1436, (A)2057**
Williams, S. B., with M. W. Harriman, comparative visibility of positive- and negative-signal c.r. traces, **2386**
Williamson, D. T. N., high-quality amplifier, **335, (D)857**
Willmer, R. W., with G. H. Rayner, effect of earth admittances in a.c. bridges, **1973**
Willshaw, W. E., and R. G. Robertshaw, operation of magnetrons near critical anode voltage, **1557**
Wilson, F. T., suppression of television interference, **1279**
Wilson, P. T., with J. S. Dryden, effect of moisture on insulating materials, **3066**
Wilson, R., noise in ionization-chamber pulse amplifiers, **1637**
—— and others, high-pressure counters and their uses, **3125**
Wilts, C. H., with others, nonlinear devices in analogue computer, **(A)918**
Windred, G., Elements of Electronics, **(B)1747**
—— with others, Outline of Radio, Television and Radar, **(B)2954**
te Winkel, J., maximum feedback in cathode-feedback amplifier, **3012**
Winkler, C. W., and M. Brasseur, 9-tower broadcasting array at WDGY, **2431**
Winternitz, T. W., input impedance of 2-wire feeder and centre-fed cylindrical aerial, **1580**
Winzemer, A. M., voltage-s.w.r. determination for transmission lines, **1719**
Wise, W. H., capacitance of a pair of insulated wires, **2416**
Witsenburg, E. C., h.f. induction heating, **1995**
—— with M. Stel, h.f. dielectric heating, **2854**
Witt, R. K., with S. Moses, ultrasonic methods for adhesion measurement, **175**
Wittenberg, H. H., photocell control of r.f. welding, **959**
Witty, W. M., KTBS transmitter, **477**
Wohlfarth, E. P., magnetic properties of Ni/Co and related alloys, **903**
Wolf, E., with E. H. Linfoot, corrector plates for Schmidt cameras, **346**
Wolf, L. J., high-gain and directive aerials for television broadcasting, **1865**
Wolfe, A. E., Jr, and F. G. Steele, direct-reading timer and clock, **391**
Wolfe, H., with J. G. Frayne, Elements of Sound Recording, **(B)25**
Wolff, —, with — Moeller, Leitfaden der Elektrotechnik. Vol. 1. Grundlagen der Elektrotechnik, **(B)2393**
Wolk, B., hot-strength of filamentary alloys, **(A)1554**
—— with H. Jacobs, gases evolved from oxide cathodes, **492**
Wolter, H., improvement of Schlieren method, **2760**
Woo, Way Dong, with An Wang, static magnetic storage and delay line, **1183**
Wood, E. A., with others, ferromagnetic resonance of Ni ferrite, **(A)2485**
Wood, G. H. H., record and stylus wear, **2413**
Woodbridge, L., and others, dimensional tolerances in c.r. tube guns, **2941**
Woodcock, F. J., electrical measurement of mechanical quantities, **(A)2306, 2581**
Woodford, J. B., with others, speed of electronic switching circuits, **1353**
Woodward, A. M., with others, properties of waveguides with periodic structure, **2706**
Woodward, J. G., calibrator for gramophone pickups, **2412**
Woodward, P. M., and J. D. Lawson, gain of aerial systems, **(D)2135**
Woodward, R. H., tentative model of the sun, **1134**
Woolley, J. C., with R. Street, magnetic viscosity in Mn-Zn ferrite, **373**; time decrease of magnetic permeability in alnico, **2483**
Woonton, G. A., diffraction effects on distant field of linear radiator, **2422**; Fresnel-field diffraction formula, **2184**
—— R. B. Borts and J. A. Carruthers, measurement of aerial radiation patterns by means of metal lens, **2133**
Wormser, E. M., design of wide-angle Schmidt optical systems, **3020**
Wouk, V., power supplies for home television receivers, **758**
Wray, A. G., reactance valves and use for f.m., **1024**
Wright, D. A., conductivity of oxide-cathode coatings, **(A)2078, 2869**; resistivity of thin metal films, **(D)1431**
Wright, R. R., Electronics, Principles and Applications, **(B)2370**
Wu-Ta-You, with H. E. Moses, distribution of O and O_2 in the upper atmosphere, **(A)1913**
Wucher, J., magnetic properties of Pd alloys, **1174**
Wulfsberg, A. H., airways v.h.f. communications receiver, **987**
Wurm, M., magnetic field-strength meter, **2830**
Wyckoff, R. W. G., Electron Microscopy: Technique and Applications **(B)3129**
Wynn, R. T. B., economics of broadcasting systems, **1250**

Y

Yabsley, D. E., with F. J. Lehany, solar radiation at 200, 600 and 1200 Mc/s, **616**
—— with J. L. Pawsey, solar r.f. radiation of thermal origin, **883**
Yager, W. A., and others, ferromagnetic resonance of Ni ferrite, **(A)2485**
—— with others, ferromagnetic resonance absorption in Mn ferrite, **2484**
Yanagisawa, S. T., and T. H. Rogers, thoria cathodes in h.v. rectifiers, **(A)2376**
Yarwood, J., An Introduction to Electronics, **(B)2868**
Yastrebtsova, T. N., with V. V. Migulin, transitron relaxation oscillator, **1380**
Yearian, H. J., d.c. characteristics of Si and Ge crystal rectifiers, **2090**
—— with others, Si and Ge rectifiers, theory of, **1941**
Yennie, D. R., with A. B. Arons, phase distortion of acoustic pulses reflected obliquely, **1840**
Yerg, D. G., importance of water vapour in microwave propagation at temperatures below 0°C, **2612**
Young, N. H., mid-level modulation for television transmitters, **765**
Young, W. R., Jr, and L. Y. Lacy, multipath echoes with 450-Mc/s car-radio transmissions, **1777**
Youtz, P., with others, M.I.T. e.s. storage tube, **(A)1554**
Yu, Y. P., applications of network theorems in transient analysis, **1610**

Z

Zadeh, L. A., variable networks, frequency analysis of, **(A)1356, 1617, (C)2737**, impulse response of, **2738**
—— and J. R. Ragazzini, extension of Wiener's theory of prediction, **2808**
—— with J. R. Ragazzini, wide-band a.f. phase meter, **1724**
Zagor, H. I., developments in electronic-analogue-computer techniques, **(A)1441**
Zaharis, G., television synchronizing generator, **2038**
Zakheim, J., with I. Podliasky, high-accuracy radio-telemetry, **1783**
Zamoroskov, B. M., phase focusing in planar magnetron, **1827**
Zanarini, G., electrodynamic volume expander, **2122**
Zenneck, J., with G. Goubau, F.I.A.T. Review of German Science, 1939–1946: Electronics, including Fundamental Emission Phenomena, **(B)520**
Zenner, R. E., magnetic-recording frequency-response measurements, **(A)1319**
Zepler, E. E., interelectrode capacitance of valves, **1313**; Technique of Radio Design, **(B)2019**
Zickner, G., calibration curve for parallel-plate capacitor, **168**; temperature coefficient of standard air capacitors, **1729**
van der Ziel, A., noise suppression in triode amplifiers, **2751**; semiconductor noise and flicker effect, **3035**; thermal noise at high frequencies, **2334**; total-emission damping in diodes, **2087**; transit-time formulae, **792**
—— and K. S. Knol, power gain and bandwidth of feedback amplifiers, **1646**
—— with T. R. Hartz, square-wave modulation in microwave spectroscopy, **1905**
Ziemau, S., with others, properties of slow electrons in polar dielectrics, **1899**
Zucker, R. S., with R. A. Ratcliffe, mobile f.m. communication equipment, **750**
Zuhrt, H., rigorous theory of tubular dipole aerials, **2977**
Zwikker, C., and C. W. Kosten, Sound-Absorbing Materials, **(B)2704**
Zyda, J., with J. Brundage, transmission-measuring set for l.f. carrier systems, **157**
Zimmermann, K. H., balanced r.f. twinax cables, **26**
Zimmermann, W., multichannel common-carrier R/T equipment, **3164**
Zinke, O., exponential transmission line as transformer, **836**; Hochfrequenzmesstechnik, **(B)173**; wide-band aerials, and resonant compensation circuits, **818**, omnidirectional, for metre and decametre waves, **817**

SUBJECT INDEX

SYMBOLS (A) Abstract, (B) Book Review, (C) Note of Correction, (D) Discussion

A

Abacs, for output-transformer design, **826**
for r.f. transmission lines, **808**
for temperature compensation of oscillatory circuits, **1373**
transfer, for low-pass iterative filters, **576**
Absorption, (See also Acoustics; Ionosphere)
acoustic, of various materials, **1566**, measurements of, **2404**
infra-red, in Si and Ge, **(A)2469**
ionospheric, by parabolic layer for oblique incidence, **1154**
microwave, of non-polar liquids, **1669**
of polar substances in non-polar solvents, **1670**
of r.f. waves in solar corona, **1398**
u.h.f., in organic liquids, **609**
and reflection, by sea water, **1904**
ultrasonic, in liquids, **1324**, f.m. method of measurement, **2116**
optical measurement of, **7**
in organic liquids, **1056**
in water and in salt solution, **528**
Acceleration meter, piezoelectric, **413**
Acoustics, (See also Absorption; Broadcasting; Impedance; Sound; Ultrasonics)
absorptive materials, properties of, **2694**
anisotropic materials, ADP and KDP crystals, properties of, **1049**
artificial ear, of C.N.E.T., **1564**
of G.P.O. and of I.N.U.A., **1565**
artificial mouth for equipment tests, **1058**
bibliography, **1, 521, 1047, 1838, 2395, 2682**
of broadcasting studios, **1847**
with adjustable reverberation time, **2407**
reverberation-time measurements in Radiodiffusion française studios, **2962**
combination tones, **560**
of conical pipes, **524**
equipment design for reverberant auditoria, **(A)1319**
of halls, intelligibility ratio as quality criterion for, **1331**
with large reverberation times, **534**
reverberation modulation, **2963**
prevention of feedback between loudspeaker and microphone, **2968**
reciprocity pressure response formula, **1062**
of rooms, **(A)533**
calculation of, reverberant absorption coefficient from acoustic impedance, **1846**
effect on intelligibility, **2966**
investigation by models, **2695**
pulse statistical analysis of, **2406**
for transient sounds, **2405**
schlieren apparatus with multi-slit gratings, **1563**
of telephone bells, **1325**
test chamber for loudspeakers and microphones, **1326**
trends in a.f. technique, **801**
white noise, applications of, **2399**
Adhesive, thermosetting, araldite, use in crystal-oscillator production, **913**
Admittance meter, **2834**
Aerial arrays, broadcasting, directive, WDGY, **2431**
m.f., design of, **(C)40**
circular and cylindrical, radiation patterns of, **(A)1338**
dipole, radiation impedance of, **2725**
directive, compensators for, **1868**
square, radiation patterns and gain of, **554**
triplet-reflector, **1342**
——**systems**, gain of, **287, (D)820, (C)1086, (D)1592, (D)2135**
Aerials, (See also Couplers; Lenses, microwave; Television; Transmission lines; Waveguides)
aircraft, flat-plate, shunt-fed, **1591**
'suppressed', **286**
biconical, theory of, **816**
broadcasting, anti-fading, **1863, (C)2716**
f.m. and television, Atlanta, U.S.A., on 1000 ft mast, **2722**
m.f., **38**
car, for amateur bands, **2132**
channel-guide, **2718**
conical-horn, e.m. field of, **2979**
radiation characteristics of, **1590**
wide-angle, input impedance of, **288**
coupled, theory of, **1585**
crossed-dipole, input impedance of, **2427**
current and charge distributions on, **(A)1338**
cylindrical, with axial-slot excitation, surface currents in, **2196**
inhomogeneous, guided waves on, **(A)1338**
with 2-wire centre feed, input impedance of, **1580**
A, multiwire, 600-Ω, for ionosphere recorders, **2975**
dielectric-rod, radiation patterns of, **(A)1867**
dielectric-tube, **(A)1338**
dipole, folded, impedance transformation in, **556**
horizontal, low, input impedance of, **2134**
impedance measurement by reflection method, **811**
$\lambda/4$, effect of ground plane on, **(A)2423**
theory of, **2978**
tubular, rigorous theory of, **2977**
directional characteristic curves and surfaces for, **2981**
directive, microwave, **1869**
rhombic, rotatable, **2429**
wide-band, for 50–170 Mc/s, **(A)1338**
dummy, transmission-line, high-load, **2577**
for elliptical and linear polarization, radiation efficiency of, **(A)1338**
for elliptically polarized waves, **1341**
feeders for, use of circle diagrams in design of, **837**
geometry and impedance characteristics of, relation between, **(A)1338**
helical, construction of, **1083**
current distribution in, **(A)1338**
design of, **555**
effect of conductor size, **283**
end-loaded and expanding, **2715**
horn, microwave, measurement of radiation patterns of, **2183**
loop, response measurement for, **(A)1338**
microwave, distant field of, diffraction effects on, **2422**
omnidirectional, wide-band, for metre and decametre waves, **817**
and open-wire lines, **281, 399**
parallel, coupled, mutual- and self-impedance of, **2136**
phase-front measurements, ripple tank for, **1979, 2841**
polar diagram of, model technique for, **558**
polar diagram and aperture distribution of, relation to angular spectrum of plane waves, **1082**
properties of, **282**
receiving, directive properties of, **2424**
protection from effects of local fields, **1586**
reflector, linear, e.m. field of, **2714**
microwave, small-surface diffraction theory for, **2721**
parabolic, calculations for, **1343**
short, limitations of, **553**
theory of, **35**
slot, combined with resonant circuit, **2709**
impedance/frequency characteristics of, **1087**
as magnetic dipoles for cm waves, **2712**
radiation from transverse slot, **1589, 2980**
theory of, **2711**
slotted-cylinder, external field of, **1588**
impedance and radiation characteristics of, **2710**
slotted waveguide, **814**
spherical-reflector, with phased line source, **2713**
television, phase-control, for co-channel interference reduction, **2655**
receiving, built-in, **819, 2719**, Philco model, **37**
design trends, **1085**
quadrature-phased, **557**
transmitting, u.h.f., with feeder system, **2425**; supergain, **36, (A)1338, 1865**

tower, voltages on guy-wire insulators, **1340**
transmitting, linear, effective length of, **1584**
transmitting and receiving, current distribution in, **2976**
turnstile, shielded, radiation characteristics of, (**A**)**1866**
u.h.f., radiation patterns of, graphical analysis of, **2720**
vertical, radiation characteristics over uneven ground, **39**
v.h.f., for radio ranges and d.f., (**A**)**1338**
wide-band, and compensation circuits, **818**
impedance of, **285**
m- and dm-wave, **2426**
Alloys, (See also Ferromagnetic materials; Magnetic materials)
Be/Cu, **2254**
Cr/Fe, for cones of c.r. tubes, tests of, **1181**
Fe/Si compacts, resistivity measurements for, **671**
filamentary, hot-strength of, (**A**)**1554**
Pd-base, magnetic properties of, **1174**
Altimeter, electronic, **192**
radio, **897**
mechanical development of, **1837**
Ammeters, critically damped, measurement of time constant of, **2831**
electrodynamic, v.h.f., **2832**
Amplidyne, performance and design of, **239**
regulation of torque and speed by, **238**
Amplification, distortionless, of d.c. pulses with a.c. amplifier, **2753**
in double-beam valves, **511**
high-efficiency, of modulated oscillations, **1385**
by interaction between electron beams, **333**
by interaction of wave with electron stream, **608**
power, electrical, modern methods of, **2457**
of very-low-frequency currents, **1640**
of weak d.c., using Hall effect, **3007**
Amplifiers, a.f., **2123**
with combined positive and negative feedback, **1390**
high-fidelity, **1641**
high-quality, **70**, **335**, (**D**)**857**, **1119**
output impedance control for, **1070**, (**D**)**1336**, (**D**)**1337**
power, cathode-follower, **599**
public-address, efficiency of output valves in, **75**
push-pull, **1118**
Rauland 1825, **1642**
selective, **1644**, RC, **1643**
simplified design of, **72**
50-W, new circuit for, **592**
a.g.c. for, **3010**
aperiodic, wide-band, **331**
bandwidth control in, **860**
for biological applications, **74**
cathode-coupled, design of, **2456**
cathode-feedback, maximum feedback in, **3012**
cathode-follower, **2749**
cathode-repeater, wide-band, **2168**
class-C, tank-capacitor voltage in, **2460**
cm-wave, noise measurement for, **930**
contact-modulated, **591**
d.c., **1889**
for biological research, (**A**)**955**, **2174**
with cross-coupled input circuit, **1122**
using electrometer valve, **1121**
negative-feedback, with grid-controlled valve converter, **2561**
wide-band, zero stabilization of, (**A**)**598**
for oscillography, **2838**
differential, improvement of rejection ratio in, **3008**
transmission factor of, **1636**, (**D**)**2169**
direct-coupled, ultra-high gain, (**A**)**1355**
distributed, band-pass, analysis and design of, (**A**)**1355**
measurements on, **2750**
wide-band, (**D**)**332**
dm-wave, German developments in, **329**
electronic, (**A**)**1998**
feedback, conditional stability of, **862**
general formulae for, **2462**
power gain and bandwidth of, **1646**
RC, **859**
and servo systems, theory of, **2175**
stability testing with square waves, **77**
German work on, **330**
i.f., gain stabilization by inverse feedback, **2461**
stagger-tuned, design of, **3009**
for television, **3191**
line, for K2 carrier system, **314**
linear, constant-gain, use of frequency changers in, **297**
input and output admittances of, **1116**
negative-feedback, for use with long coaxial cable, **3013**
for use with ionization chamber, **1888**
l.f., selective, **596**, **1120**, (**C**)**1645**, flicker effect in, **1120**
magnetic, (See also Transductors) **43**, (**D**)**45**, **46**, **47**, **1348**, **1598**, (**A**)**1998**, **2728**
analogue-computer study of, **2731**
analysis of transients and feedback in, **1873**
balance-detector type, (**A**)**2139**
and Barkhausen noise, **298**
effect of supply frequency on performance of, **44**, (**D**)**563**
as frequency control for alternator, (**A**)**2355**
self-saturable, analysis and design of, (**A**)**1355**
self-saturation in, (**A**)**565**
for temperature regulators, **2990**
theory of, **1597**, (**A**)**1599**, **2729**, **2730**
magnetron, new type, **1829**
multi-stage, amplification and bandwidth for, **861**
negative-feedback, **863**, (**D**)**1123**
conditions for critical damping, **2464**
design of, **2176**
wide-band, transients in, **78**
with negative-resistance load, **2170**
nonlinear, **2748**
power, grounded-grid, **593**
pulse, fast, **73**
for use with ionization chamber, signal/noise ratio in, **1687**
push-pull, phase inverter for, **1387**
RC, theory of, **597**
selective, using RC feedback networks, **3011**
semi-distributed, theory of, **1635**
stagger-tuned, design of, **856**, (**A**)**1355**
low-pass, **1114**
television. See Television.
transient-response calculation for, **2172**
travelling-wave, chain, 200-Mc/s bandwidth, **594**, **595**, **2048**
triode, noise suppression in, **2751**
wide-band, cathode neutralization of, (**C**)**339**
design chart for, **2173**
matching to cm-wave self-oscillator, **2148**
for oscilloscopes, **1723**
phase-error compensation in, **2752**
use of secondary-emission valves in, **336**
400-Mc/s, using Type SN-978B r.f. pentode, (**A**)**1355**
Analogies, band-pass/low-pass, theory of, **61**
Analogues, electrical, of linear systems, (**A**)**834**
Analysers, a.f., applications of, **2280**
with rapid automatic scanning, **936**
harmonic, giving Fourier coefficients, (**A**)**674**
intermodulation, for a.f. systems, **2840**
pulse-amplitude, **1448**
video-frequency, for noise spectra, **165**
Anemometer, acoustic, with c.r.o. display, **950**
hot-wire, for low speeds, **972**
Astronomy, radio, (See also Cosmic noise; Solar radiation)
review of, **91**
Atmosphere, (See also Ionosphere; Stratosphere; Troposphere)
ozone measurements, **1912**
pressure and temperature gradients over central Europe, **940**
refractive-index fluctuations, microwave recording of, **2565**
stratification of, **2219**
total O_3 content and troposphere temperature, **625**
tropopause fluctuations, **624**
upper, distribution of O and O_2 in, **1149**, (**A**)**1913**
meteor ionization in, (**A**)**1410**
review of present knowledge of, **94**
temperature distribution over New Mexico, **2214**
winds in, meteor-trail-echo study of, **3052**
Atmospheric electricity, field variations at Monaco, **1687**
measurement of vertical electric field, **140**
Atmospherics, **361**
in Antarctic, large-scale variation of level of, **97**
London University research on, **2216**
in North and South Canada, level of, **3048**
recorder for, **2282**
sudden increases on long waves, **1499**
Type-4, fine structure of, **2508**
waveforms of, **893**
Attenuation, determination from impedance measurements, **3094**
of plane waves by obstacles, **601**
Attenuators, microwave, **600**
high-power, for 1–10 kMc/s, **2843**
piston, calibrated, for mm λ, **1193**
corrections for, **280**
theory of, **813**, (**C**)**1582**
TM-mode, design of, **1976**
for waveguides, high-power, **864**
magnetically controlled, **337**
Audiometer, Type TF895, **800**
Audiometry, (See also Hearing)
watch as noise source for, **1064**
Aurora, radar reflections from, **1688**
and sky waves in 1947, **728**
10-cm radiation from, origin of, **2776**

B

Barium titanate. See Ferroelectric materials.
Batteries, accumulator, light-weight, Ag/Zn, **1255**
military, recent developments in, **2904**
recent patents on, **3177**
primary cells, internal resistance and electrolytes of, **1011**
Beacons. See Navigation aids.
Betatrons. See Particle accelerators.
Bolometers, cavity-resonator, wide-band, for λ 10 cm, **167**
Book notices and reviews, on mathematics, physics, electronics, radio communications, etc., recent publications, **1893**
Abriss der Dauermagnetkunde, **1947**
Acoustic Measurements, **1857**
Acoustical Designing in Architecture, **2705**
Advances in Electronics, Vol. 2, **2006**
Aerials for Centimetre Wavelengths, **2432**
Aerials for Metre and Decimetre Wavelengths, **822**
Anwendung der elliptischen Funktionen in Physik und Technik, **2820**
Applications of the Electronic Valve in Receiving Sets and Amplifiers **991**
Applications physiques de la Transformation de Laplace, **990**
Applied Mathematics for Engineers and Scientists, **1716**
The A.R.R.L. Antenna Book, **1346**
Atmospheric Electricity, **98**
Basic Electrical Engineering, **2952**
Basic Electronics, **974**
Basic Television, **772**
Calcolo Tensoriale e Applicazioni, **2268**
Cathode-Ray Tube Traces, **2298**
Communication Circuit Fundamentals, **1891**
Communication Circuits, **1650**
Compléments de Mathématiques à l'Usage des Ingénieurs de l'Électrotechnique et des Télécommunications, **888**
Cosmical Electrodynamics, **2777**
Counting Tubes, **2319**
Dizionario Tecnico della Radio, **1317**
Einführung in die Lehre von den Schwingungen und Wellen, **882**
Einführung in die Siebschaltungstheorie der elektrischen Nachrichtentechnik, **1651**
Einführung in die Theorie der Spulen und Übertrager mit Eisenblechkernen, **341**
Elastomers and Plastomers: their Chemistry, Physics and Technology, **3078**
Electric and Magnetic Fields, **1399**
Electrical Measurements in Theory and Application, **2297**
Electron Microscopy: Technique and Applications, **3129**
Electron-Tube Circuits, **1652**
Electronic Engineering Master Index for 1947–1948, **2394**
Electronic Valves: Books II–IV, **2388**
Electronics: Experimental Techniques, **2007**
Electronics in the Factory, **435**
Electronics, Principles and Applications, **2870**
Elektrotechnik des Rundfunktechnikers, Teil 1: Gleichstrom, **2110**
Éléments de Calcul Tensoriel, **2269**
Elements of Electronics, **1747**
Elements of Sound Recording, **25**
L'Emission Électronique, **793**
The Extrapolation, Interpolation and Smoothing of Stationary Time Series, with Engineering Applications, **2465**
Facsimile, **2656**
F.I.A.T. Review of German Science, 1939–1946: Electronics, incl. Fundamental Emission Phenomena, Part 2, **520**
Fluorescence and Phosphorescence, **1711**
Fourier Methods, **2816**
Frequency Modulated Radar, **1921**
Fundamental Electronics and Vacuum Tubes, **1037**
The Fundamentals of Electromagnetism, **355**
Fundamentals of Radio Valve Technique, **519**
Fundamentals of Synthetic-Polymer Technology in its Chemical and Physical Aspects, **3077**
Fundamentals of Vacuum Tubes, **2099**
Giant Brains, or Machines that Think, **2273**
Glass-to-Metal Seals, **2256**
Glossary of Terms used in Radar, Supplement No. 4 (1950) to B.S. 204:1943, **2517**
Hochfrequenzmesstechnik, **173**
Höhere Mathematik für Mathematiker, Physiker, Ingenieure, **1445**
Les Hyperfréquences, Circuits et Propagation des Ondes, **3220**
Industrial Electronics, **2318**
Industrial Electronics and Control, **2869**
Integralgleichungen, **390**
Integraltafel, Erster Teil: Unbestimmte Integrale, **2815**
International Radio Tube Encyclopedia, **1038**
Introduction to Applied Mathematics, **1444**
Introduction to Complex Variables and Applications, **2270**
Introduction to the Differential Equations of Physics, **2272**
An Introduction to Electronics, **2868**
Introduction to the Luminescence of Solids, **1946**
An Introduction to the Theory and Design of Electric Wave Filters, **2177**
Ionization Chambers and Counters, Experimental Techniques, **2805**
Ions, Electrons and Ionizing Radiations, **3036**
Lehrbuch der Elektrotechnik, Vol. 1, **2111**
Leitfaden der Elektrotechnik. Vol. 1. Grundlagen der Elektrotechnik, **2393**
Luminescent Materials, **2255**
The Magnetic Amplifier, **2466**
Magnetism, **2202**
Maintenance Manual of Electronic Control, **246**
Mathematics of Circuit Analysis, **389**
Matrix Analysis of Electric Networks, **1892**
Die Maxwellsche Theorie in veränderter Formulierung, **2201**
The M.K.S. System of Electrical and Magnetic Units; British Standard 1637, **2200**
N.A.B. Engineering Handbook, **3221**
Networks, Lines and Fields, **865**
Numerical Calculus, **2822**
Oscillations of the Earth's Atmosphere, **2217**
Outline of Radio, Television and Radar, **2954**
Partial Differential Equations in Physics, **2821**
Permanent Magnets, **340**
The Physical Society Reports on Progress in Physics, Vol. 12 (1948–49), **881**
Piezoelectric Crystals and their Application to Ultrasonics, **2807**
Principles of Electricity and Electromagnetism, **1673**
Principles and Methods of Telemetering, **1746**
The Principles of Television Reception, **1548**, **3194**
Progressive Mathematics, **3085**
Radar Scanners and Radomes, **651**
Radio Aerials, **1089**
Radio Engineering, Vol. 2, **1318**
Radio-Frequency Heating, **973**
Radio-Frequency Heating Equipment, **434**
Radio Handbook, **2953**
Radio for Merchant Ships. Performance Specification for Lifeboat Portable Radio Equipment, **3174**
Radio Receivers and Transmitters, **2336**
Radio Research Special Report No. 19. Lateral Deviation of Radio Waves reflected at the Ionosphere, **985**
Radio Servicing Equipment, **2299**
Recent Advances in Radio Receivers, **2020**
Some Recent Researches in Solar Physics, **2509**
Les Récepteurs de Radiodiffusion, **738**
The Recording and Reproduction of Sound, **2414**
Reference Data for Radio Engineers, **268**
Röhren Vade-Mecum 1950, **2681**
Rundfunkröhren, Eigenschaften und Anwendung, **1835**
Short-Wave Radio and the Ionosphere, **2218**
Siebschaltungen mit Schwingkristallen, **3016**
Sound Absorbing Materials, **2704**
Sound Reproduction, **1071**
A Symposium on Electronics, **2008**
Die Systemtheorie der elektrischen Nachrichtenübertragung, **1010**
Tables of the Bessel Functions of the First Kind of Orders Fifty-Two through Sixty-Three, **2819**
Tables of Bessel Functions of Fractional Order, Vol. 2, **2818**
Tables of Inverse Hyperbolic Functions, **2817**
Technical Dictionary, German-English-French, **1046**
Technique des Ondes Très Courtes et Ultra-Courtes: Tome I—Circuits Oscillants et Tubes à Vide, **3017**
The Technique of Radio Design, **2019**
Technisches Wörterbuch (Deutsch-Englisch): Vol. 1, **1316**
Television Explained, **2367**
Television for Radiomen, **1799**
Television Simplified, **2921**
Testing by the National Bureau of Standards: N.B.S. Circular 483 [illegible]
Theory and Design of Electron Beams, **2389**
The Theory and Design of Inductance Coils, **2758**
Theory of Dielectrics, **1674**
Theory of Oscillations, **1648**
Time Dependence of Electronic Processes in Dielectrics, **2199**
Traité de Prise de Son, **1579**
The Transductor Amplifier, **2757**
Transformation Calculus and Electrical Transients, **2271**
Transients in Linear Electrical Systems, **1649**
Treatise on Powder Metallurgy: Vol. 1—Technology of Metal Powders and their Products, **383**
Les Tubes Électroniques et leurs Applications, **1069**
Der Ultraschall und seine Anwendung in Wissenschaft und Technik, **2703**
Vacuum Equipment and Techniques, **1945**
Breakdown, in cold-cathode tubes at low pressure, **873**
h.f., in spherical cavity, **2191**
u.h.f., of air, **2796**
Bridges, a.c., for dielectric measurements, development of, **1456**
differential-amplifier null detector for, **1189**
effect of earth admittances in, **1973**
bolometer, for r.f. voltage measurement, **1974**
capacitance, with mechanical rectifier, **944**
d.c., with bolometer arm, analysis of, **1728**
h.f., for cable-impedance deviations, **1972**
impedance, S.A.C.M. No. 2135, **943**
v.h.f., **1457**
impedance-comparison, for 40–270 Mc/s, **156**
resistance, self-balancing, **689**
square-wave excitation of, (**D**)**942**
Wheatstone, new design of, **941**
Broadcasting, (See also Aerials)
in Austria, 1924–1949, **234**
Copenhagen frequency allocation, technical repercussions of, **2343**
f.m., demonstration of equipment, **535**
field-strength measurements near Geneva at 93 Mc/s, **984**
h.f., in Australia, **746**
multiplex, in Australia, **2023**
pack-set transmitter-receiver for commentators' use, **2685**
u.s.w., German technique, **2898**
N.W. Germany network, **2900**
S.W. Germany network, **2901**
in U.S. Zone of Germany, **2899**
——**stations,** a.f. equipment for, **2027**, **3171**
Istanbul, 150-kW, **1775**
KENI, Anchorage, Alaska, **1774**
KTBS, Shreveport, **232**
WTCN, Minneapolis, [illegible]
——**systems,** a.f. measurements for, **147**, **148**
design and operation economics of, **1250**
u.h.f., multiplex, p.t.m., **996**

C

Cables, coaxial, with elliptical cylindrical conductors, **27**
irregularities in, pulse measurement of, **2278**
statistical study of, **1073**
London/Birmingham, television, **276**
measurement of transmission constants of, **2572**
optimum design of, **2415**
reflection-free insulating disks in, **809**
theory of, **1072**
fault location by pulse methods, **3091**
multicore, for television camera, **1581**
twinax, balanced, for r.f. power transmission, **26**
Calculating machines. See Computers.
Cameras, (See also Optical systems, Schmidt; Recorders; Television)
c.r.o., for ionosphere layer-height recording, **470**
ultra-high-speed, **3178**
Capacitance, of conductor bounded by two intersecting spheres, **880**
Capacitors, coaxial, $BaTiO_3$, for production of short-duration spark, (**A**)**2604**
cylindrical, capacitance of, calculation of, **141**
design of, influence of operating conditions on, **2736**
hermetic sealing of, **1180**
metallization of paper for, **123**
parallel-plate, calibration curve for, **168**
performance measurement for, (**A**)**1454**
series resistance of, direct-reading instrument for, **2287**
standard, air-dielectric, temperature coefficient of, **1729**
substandard, low-value, **680**
3-terminal, theory of, **2438**
Carrier-current systems, (See also Communication systems)
asymmetrical, transient response of, (**A**)**1511**
f.m., using m and dm waves, **1001**
multichannel, noise level in, **1008**
in Germany, 1935–1945, **2889**
K2, line amplifier for, **314**
l.f., measurement equipment for, **157**
on overhead lines, radiation from, **2349**
for power lines, s.s.b. vs f.m. methods, [illegible]
voice-operated switching for, **1243**
600-channel, French P.T.T., terminal equipment for, **2022**
Cathode-ray oscillograph, for aligning i.f. amplifiers and band-pass filters **3100**
application of electronic switching to, **1602**
for investigating functions of two variables, **3111**
portable, Philips Type-GM5655, **1459**
——**oscillography,** h.f., German developments in, **405**
high-speed, photographic techniques for, **759**
using 'integral-curve' method, **3099**

——**oscilloscopes**, dynamic sensitivity at v.h.f., 1461
  simple type, 1458
  travelling-wave, 264
——**tubes**, (See also Television)
  beam-deflection, nonlinear, Type QK-256, 2940
  comparative visibility of positive- and negative-signal traces, 2386
  co-ordinate, for use with e.s. storage tubes, 2867
  for decimal counter, 2374
  electron guns, dimensional tolerances for, 2941
  for large-screen television projection, 3187
  metal-cone, tests of Cr/Fe alloys for, 1181
  monoformer, (A)1355
  permanent-magnet focusing for, 1787
  screens, double-layer, for television projection, 2047
    for radar, 267
    specification for visual quality of, (A)1454
  signal-storage type, 2942
  spot-distortion correction in, 1823
  for study of transients, 506
Cathodes, (See also Electron emission)
  boride, 3207
  and cathode heaters, of conductive ceramic, (A)2065
  emission variation with heating power, 1805
  oxide, conduction mechanism and emission of, 491, 2071, 2934, 3208
    conductivity of, (A)2078, 2669
    dense, thermionic properties of, (A)2073
    diode tests on, (A)2079
    effect of coating composition on emission of, (A)1436
    effect of Ni-core impurities on emission of, (A)1554, (A)2074
    electronic and thermodynamic temperatures of, 1303, 2068
    emission of, 1304
    experimental investigation of, 2380
    figure of merit and performance of, (A)2082
    figure of merit and quality ratio for, (A)2081
    gases evolved from, 492
    life tests of, (A)2083
    Mg/Ni base for, (A)2070
    operation at low duty factor, (A)2668
    properties of Ba_2SiO_4 interface, 490
    pulsed, potential distribution in, 1302, 2067
    pulsed emission of, (A)2080
    pulsed operation of, 2667
    thermodynamics of, 493
    with ZrO_2, (A)2055
  Sb-Cs, properties of, 1800
  secondary-emission, $MgO/BaCO_3$, 1556
  temperature measurement for, 265
  thoria-coated, activation of, 1300
    base-metal effects in, (A)2077
    emission, conductivity and contact potential of, (A)2072
    investigation of, (A)1933
    performance in h.v. rectifiers, (A)2076
    preparation by cataphoresis, 2069
    rate of disappearance of thoria from, (A)1935
    thermal emissivity of, (A)1936
Cauer, Wilhelm, life and work of, 2105
Ceramics, (See also Insulating materials)
  conducting, for valve cathodes and heaters, (A)2065
Charts, design, for wide-band amplifiers, 2173
  'G' curves for valve-circuit design, 292
  reactance, use for filter design, 577
  for tanh x/x, 935
Circle diagrams, general theory of, 2434
  use in feeder problems, 837
Circuit analysis, applications of network theorems, 1610
  using Fourier transforms, 307, 2441
——**constants**, R-Q factor, 295
——**design**, frequency- and time-domain viewpoints in, (A)1355
——**theory**, (See also Networks)
  application to waveguide problems, 56
  Bode's, aspects of, 835
  reciprocity between generalized mutual impedances, 1258, 2444
Circuits, (See also Networks)
  beam-switching, for c.r.o., 1091
  cathode-follower, as a.f. power amplifier, 599
    analysis of, 1386
    graphical study of, 1639
    input-capacitance reduction for, 858
    output, 1115
  coincidence and mixing, Ge-diode, 1958
  compensation, resonant, for wide-band aerials, 818
  control, design with aid of circle diagrams, 1594
  correction, complex, for television amplifiers, 1369
  coupled, resonance frequencies and characteristics of, 1625
    triple-tuned, high-Q, analysis of, 2745
  differentiating and integrating, RC, time constants of, 1103
  equalizer, reactive, design of, 846
  equivalent, for linear a.c. elements, 2983
    for slots in rectangular waveguide, (A)1338
  feedback, mathematical analysis of, 2443
  flip-flop, cathode-coupled, operating conditions for, (D)1106
  gate, diode, design of, (A)1441
  input, low-noise, design factors for, 1504, (C)2018, (D)2619
  integrating, Miller, low-speed, 1111, (C)1631
    transitron, 852
  integration method of linearizing exponential waveforms, 328
  linear, lumped-constant, time constants for study of, 1607
  linear varying-parameter and nonlinear, analysis for, 1606
  matching, for magnetron modulator, 552
  multiplying, fast, (A)2558
  multivibrator, asymmetrical, 3006
    recent developments of, 1886
  negative-resistance, characteristics of, 2137
  oscillatory, abac for temperature compensation of, 1378
    with discontinuous linear characteristic, oscillation phenomena in, 2447
    nonlinear, phenomena in, 582, theory of, 306, 581, 847
    with periodically variable resistor, 3001
    RC, response to multiple pulses, 64
    resonance-curve calculations for, 316
  output, RC-coupled, conditions for maximum output, 1888
  phase-inverter, for push-pull amplifiers, 1387
  p.w.m., 854
  rectifier, square-law, for meters, 3096
  resonant, detuned, transient response of, 1102, (D)1374
    with time-varying parameters, 583
  response to repeated pulses, 561
  scaler, high-speed, 2587
  smoothing, LC, 58
  sweep, panoramic, 68
  switching, electronic, speed of, 1353
  tank, as dm-λ resonators, 65
    v.h.f., transmission-line, 79
  trap, absorption, design of, 841
  trigger, magnetic, 2437
    transistor, 53, (A)1355
  valve, 'G'-curves for design of, 292
Clocks, quartz-crystal, 2274
    development of, 135
    monitoring by means of time signals, 922
    P.T.R., and the length of the astronomical day, 2275
  synchronization by means of time signals, 1446
Clouds, height measurement by means of light pulses, 427
Clutches, magnetic-fluid, 969, 2585
    for servomechanisms, 237
Coils, choke, premagnetized, permeability of, 568
  ferrite-cored, as converters, amplifiers and oscillators, 51
  iron-cored, distortion with, 829
  with pot cores of powdered iron, magnetic characteristics of, 3078
  solenoid, inductance calculation for, [illegible]
    magnetic field in, 1700
    single-layer, inductance formula for, 52
      screened, losses in, 2852
  stranded-wire, h.f. resistance of, 802
  for television receivers, design of, 587
  toroidal, inductance of, 1874
  universal winding machine and winding patterns for, [illegible]
Communication, theory of, 1241; 1764, 3154; 3155
    application of correlation functions, 2262
    application to periodic radio systems, (A)1511
    for asynchronous multiplex systems, 1767
    and multiplex operation, 3156
    in presence of noise, 1512, 2338
    statistical, 2888
    Wiener's, extension of, 2806
——**equipment**, (See also Receivers; Transmitters)
  mobile, f.m., 750, for small towns, 1525, Type SRR192, 3172
    I.R.E. standard test methods, 678
    v.h.f., 1247, British, 2630, design problems of, 2628, for railways and heavy industries, 464
  p.m., multiplex, 2025, use of modulation converters in, 2024
  R/T, multichannel, common-carrier, 3164, microwave, p.m., 3165
  s.s.b., development by U.S. Signal Corps, (A)1511
  telescopic mountings for, 1015
——**systems**, (See also Carrier-current systems; Radio links; Radiotelegraphy; Radiotelephony; Relay systems; Telephony)
  carrier-telephony, 12-channel, 2891
  f.m., s.s.b. methods in, 743
  inductive, for prompting, 227
  light-beam, effect of atmospheric conditions and of wavelength, 1514
  mobile, 2631
    Citizens' radio, range tests for, 1246
    F.C.C. frequency allocations, 741
    f.m., for South Australian police, 749
    planning of v.h.f., 'business radio', (AD)233
    R/T, Metropolitan Police, 2626
    v.h.f., 751, multistation, 2627, multistation, f.m., 2632, planning of, 1248, 2629
  mobile and point-to-point, v.h.f., 231
  multichannel, common-carrier and multiple-carrier, comparison of, 3157
  multiplex, v.h.f. techniques for close channel spacing, (A)1511
  narrow-band, data transmission in, (A)1511
  p.c.m., and distortion with logarithmic sampling, 1003
    signal/noise ratio in, 460
  p.m., (D)1517
    narrow-band, 2345
    optimum pulse shape for, 1518
    transmission efficiency and Hartley law, 1513
  p.t.m., interference characteristics of, 1770
    multichannel, design of, 462
  radio, s.s.b., 2623
  R/T, ship/shore, for port of Liverpool, 2633, 3173
  secret, theory of, 993
  speech transmission in channels with restricted bandwidth, (A)1511
  teletypewriter, military, in second world war, 2621
  v.h.f., point-to-point, (D)1521
Compass, magnetic, transmitting, Admiralty type, 2004
Components, miniaturization techniques, (A)1355
  new, in world market, 1124
  and subassemblies, U.S. standard designations for, 1836
  subminiature, in equipment design, 1372
  v.h.f., German work on, 338
Computers, analogue, for chain-reaction pile, 3062
    c.r. computer for higher-order equations, 1442
    design for servo problems, 1715
    differential analyser, electronic, 386
    for flight simulator, (A)2266
    for integral transforms, 2811
    isograph, for roots of polynomials, 1949
    linear, design of, 2809
    linear equation solvers, 2264
    nonlinear devices in, (A)918
    for partial differential equations, 1954, (A)1955
    photoformer function generator for, 2814
    servomechanism theory for, 919, 1714
    simultaneous-equation solvers, 673, 3084, stabilization of, (D)1956
    for solution of differential equations, 1951
    for solving secular equations, 2812
    technique of, developments in, (A)1441
    Type OME, 1443, Type OME III, 1950
    use of feedback in, 2810
  co-ordinate c.r. tubes for use with e.s. storage tubes, 2867
  differential analyser for the Schrödinger equation, 2557
  digital, binary, arithmetical operations in, 3061
    binary quantizer for, 672
    Bell relay computer, 387, Mark V, 1184
    c.r. tube for digit storage, 2005
    EDSAC, 917, programme organization and initial orders for, 3063
    electronic correlator, (A)1441
    gate-type shifting register for, 675
    high-speed, 1952, 2263
    magnetic storage drum for, (A)1441
    at Manchester University, 133
    polycathode glow tube for, 266
    pulse storage in magnetic wire, 2265
    R.C.A. Radechon storage tube for, (A)1441
    reliability of, marginal checking as aid to, (A)1441
    static magnetic pulse control and information storage for, (A)1441
    static magnetic storage and delay line for, 1183
    at University of California, (A)1441
  historical development of, 916
  programming for playing chess, [illegible]
Conduction, effect of magnetic fields on, 2479
Conductivity, complex, of ionized gases for microwaves, 875
  electrical, and the Bloch integral equation, 3023
    of glass, 2801
    of solids and semiconductors, 2543
    of thin wires in axial magnetic field, 2762
Conductors, transient currents in, density distribution of, 1900
Conferences and conventions, acoustics, Moscow 1949, 1048; A.I.E.E./I.R.E., electronic instrumentation, 1949, (A)955; architectural acoustics, Marseilles, 1950, 2961; broadcast engineers, Atlanta, 1949, 1045; C.C.I.F., May 1949, 455, Paris, July 1949, 455, 994, 2622; C.C.I.R., television standards, Zürich, 1949, 1537; electrical instruments and measurements, Stockholm, 1949, 1962; European broadcasting, Copenhagen, 992; high vacuum, Cambridge, Mass., 1947, 896; I.E.E., ferromagnetic materials, November 1949, 907, 1929; Institute of Metals, London, metallurgical applications of the electron microscope, 1214; ionospheric research, at Pennsylvania State College, 611, 637; I.R.E. Australia, Sydney, November 1948, 795, Melbourne, 1950, 2108; I.R.E., San Diego, California, 1950, aerials and propagation, 2974; noise, London, 1948, 1066; Physical Society, ionosphere, Cambridge, July 1949, 1406, ultrasonic applications, 1949, 1961; S.E.V., mains control, Berne, 1949, 1744; S.I.M.A., electronics symposium, London, 1949, 708, 956, 1998; s.w. broadcasting, Mexico City, 1948/49, 458, 992; ultrasonics, Rome, 1950, 2897; U.R.S.I. Australian Committee, Sydney, January 1950, 2493
Control, (See also Circuits; Electronic applications; Frequency control; Servomechanisms; Telecontrol)
  automatic, of exposure in aerial photography and television, 1999
    of moisture content, 182
    of thermionic emission, 2849
  circuits, amplidyne, stability of, 2354
  electronic, of resistance welding, 958
  feedback and negative resistance, coordination of, 1347
  motor, requirements for d.c. adjustable-voltage drives, 704
  photocell, of r.f. welding, 959
  process, by means of gas-filled valves, 963
  review of possible methods, 1744
  temperature, using magnetic amplifiers, 2990
  torque and speed, by amplidyne, 238
——**systems**, centralized, Landis and Gyr, 1744
  mains, Zellweger A.G., Uster, 1744
Converters, (See also Frequency converters)
  d.c./a.c., for h.f. induction heating, 952
    for servosystems, 754
Cores, laminated, magnetic after-effect for weak alternating fields, 1948
Corrosion, of Cu wires in contact with insulating materials, 3066
Cosmic noise, r.f., from galaxy, (A)356, 614, 3040, from Taurus A, 887
    point sources of, 1405
——**theory**, hydromagnetic equations, derivation of, 2770
Counters, argon, pulses in, 3126
  auxiliary apparatus for, 3122
  crystal, 2860
    diamond, effect of light on, 1202, 3124, γ-ray, phenomena in, [illegible] (A)2602
    Ge, 1987
    theory of, 879
  electrical, design of, (A)955
  electronic, direct-reading, 1090
  G-M, for civilian defence use, 2861
    dead time and recovery time in, 2864
    electric field in, 1986
    electron mobilities in, 178
    equipment for use with, 698
    glass-walled, with external cathode, 699
    in industrial radiology, 1203
    ion mobilities in, 700
    for lecture use, 2603
    portable, 1200
    quenching circuit for negative h.v. supply, 179
    self-quenching, dead times of, 948, plateau slopes in, 1984, temperature dependence of, 702, 1983
    small, 1732, for biological application, (A)955
    speed of, 180
    spurious counts in, 701, 2862
    time lags in, 1985
    velocity of discharge propagation in, 1982, 2863
  high-pressure, and their uses, 3125
  l.v., theory and properties of, 2859
  operation of, thyratron circuit for, 3120
  parallel-plate, spurious discharge in, 1201
  proportional, BF_3-filled, 3127
    fluctuations in, 1468
    for measurement of soft radiation, (A)955
    stabilizer for, 1199
  pulse, decade, 830, for G-M tubes, 2144, with neon indicators, 2733
    with scaling-down circuit, 831
  with pure-vapour filling, 3121
  ring, 3-decade, using neon diodes, 832
    using pentodes, 2145
  scintillation, for α-particles, 2858
    using transistors, 1092
Couplers, aerial, Π-network, design of, 571, (C)1363
  directional, coaxial, with circular coupling hole, 1611
    for impedance measurement at u.h.f., 1720
    microwave, 1081
Coupling, output, of valve oscillators for industrial heating, 1376
Crystals, (See also Piezoelectric crystals; Quartz)
  electron scattering in, 3031
  ionic, dielectric constant of, 381, 1656
  non-polar, deformation potentials and mobilities in, 3032
  one-dimensional, electronic properties of, 878
  tensor expression for optical, electro-optical and photoelastic effects in, 2745
Current distribution, in cylinders, and temperature distribution, 350
  measurement, a.c., compensator for, 152
    with ammeter of zero apparent resistance, 2560
    d.c., 1–10 kA, 1455
Cyclotrons. See Particle accelerators.

D

Demodulation, of f.m. carrier and random noise by discriminator, 448
Designing, industrial, cost reduction in, (A)1559
    evolution of, (A)1559
    procedure in, (A)1559
    sales attitude towards, (A)1559
Detectors, crystal, use as mixers, 1634
  f.m., beam-deflection valve for, 224
  linear, signal/noise ratio of, 221
  ratio, theory of a.m. rejection in, (A)1501
  r.f., CbN superconductor as, 223
  Si-crystal, theory and experiment, 788
  standing-wave, loading effects of, 691
    microwave, 688
  synchronous, 222
Diamond, (See also Counters, crystal)
  electron-bombardment conductivity of, 1673
  mobility of electrons and holes in, 3123
  photoelectric properties of, 3055
  use for gramophone styli, 2702
Dielectric constant, of air, at λ 10 cm, as function of humidity, 2827
  of benzene, 125
  and dissipation factor, measurement of, (A)2277
  of fluid mixtures at u.h.f., 1708, (C)3071
  of gases, 128
  of ionic crystals, 381
  of liquids, 396
  of liquids and gases under pressure, 1433
  measurement, at 50 kc/s – 100 Mc/s, 2563, at 100 – 1000 Mc/s, 3092, at 9 kMc/s, with recording refractometer, 2564
  of polar liquids, 124
  of solids and liquids, 397
——**loss**, with changing temperature, (A)137
——**measurements**, equivalence of temperature and frequency in, 3022
——**properties**, of animal tissues at m and cm λ, 1197
  of biological substances at dm λ, 2546
  of human body, at λ=1–10 cm, 3108
  measurement, at 20°–80° C and dm λ, 2559, at u.h.f., 1452
  of Pb and Ba/Pb zirconates, 1434
  of various titanates, at cm λ, 121
Dies, diamond, drilling by h.v. and electrolytic methods, 2805
Diffraction, (See also Sound; Wave propagation; Waves)
  of e.m. waves, by aperture in plane screen, 202, (C)2320
    by circular disk, 2182
    by cylindrical obstacle, 1898
    by plane conducting screen, 85, 2471, 2472, 2473
    by plane screen, 2183
  Fresnel-field formula, 2184
  microwave, by circular aperture, 3141
    by small perfectly conducting surfaces, 2721
  of plane e.m. waves, by circular aperture, 83, (D)84, 1897
    by circular disk or aperture, 2767
  of plane wave, through grating, 2179
  of radar wave, by conducting wedge, 3136
    by semi-infinite screen, 1219
  scattering of e.m. waves by spheres, 870
  of sound pulse at open end of semi-infinite duct, 2683
  of sound waves, by circular disk and aperture, 2114
  theory, critical review of, 345
    integral equations in, 1654
Dimensions, of physical quantities, 2468
Direction finders, Adcock, polarization errors in, 1419
  automatic, rotating aerial system for, 1159
  30–100 Mc/s, fixed H-Adcock, 1418
——**finding**, errors in, (A)1418
  great-circle bearings and distances, computation of, 2510
  relations between speed of indication, bandwidth and signal/noise ratio, 364
  wartime developments in Germany, 363
Directories, of U.S. radio stations and equipment manufacturers, 2897
Discharge, arc, in magnetic field, wind produced by, 2481
  electrical, positive-ion collection by probe in, 1901
  glow, effect of oxide-cathode temperature on, 2768
  spark, positive streamer mechanism of, 57
——**tubes**, glow, polycathode, for digital counting, 266
    relaxation oscillations in, 351
Discriminators, for a.m. f.m. receivers, 446
  crystal, for f.m. oscillator stabilization, (A)1550
  transmission-line, 2331
  voltage, application to d.f., 896

Dispersion, of electro-magneto-ionic waves, graphical study of, **1665**
Displacement measurement, f.m. methods for, **174**
Distortion, f.m., in linear systems with slightly irregular transfer characteristics, (**A**)**1338**
  frequency dependence for iron-cored coils, **829**
  harmonic, in sound receivers, **799**
  intermodulation, measurement of, **1468**
  meters, **937**, **2571**
  modulation, band-pass filters for, **844**
  nonlinear, automatic recording of, **2964**
    in f.m., **1002**
    in valve circuits, **1647**
  phase, in transmission lines, **2125**
  in p.w.m., **1771**
  signal, in television receivers, **1545**
  in sound-recording systems, (**A**)**1319**
  of transients in networks, **1101**
  due to 2-path propagation, **451**
Dynamic systems, linear, transient response of, (**C**)**55**

E

Eddy currents, losses due to, determination of, **3095**
Einstein, symposium on relativity to mark 70th birthday of, **1041**
Electrets, theory of, **2187**
Electrical constants, of materials, measurement of, **393**
Electricity, philosophy of teaching of, **1042**
Electrodes, microspaced, technique for production of, **3068**
Electrolysis, and electrophoresis, of thoria and thorium nitrate, **3059**
Electrolyte tank, for automatic plotting of electron trajectories, **1718**
  for network response measurements, (**A**)**1360**
Electromagnetic field, application of conformal transformation to, **548**
  distribution measurement, **395**
  of linear radiator, **2714**
  of magnetic dipole in stratified atmosphere, **284**
  of point source in multilayer medium, **1216**
——**induction**, in circular disk, **2488**
  in nonuniform thin sheets and shells, **352**
  in rotating sphere, **606**
——**theory**, attraction between parallel currents, **1396**
  general operator field equations, **1895**
  Heaviside's, (**A**)**2194**, unpublished notes on, (**A**)**2178**
  Maxwell's second law, **605**
Electromagnetism, and gravitation, **1675**
Electromagnets, small, high-field, **912**
Electrometers, as bridge-balance indicators, **938**
  new type of, **3097**
  use of multigrid valves as, **150**
Electron beam, in axial magnetic field, **2376**
  axially symmetric, of uniform cross-section, **481**
  in axially symmetric e.s. and e.m. fields, **1395**
  cylindrical, magnetic focusing of, **485**, **785**, **786**
  production and application of, **1128**
  quantum effects in interaction with h.f. fields, **603**, (**C**)**1658**, **3196**
  spiral, interaction with resonant cavity, **1626**
——**diffraction**, **433**
  apparatus for investigating insulator surfaces by, **3107**
——**emission**, secondary, from dielectrics, **3028**
    from metal mixtures, **2526**
  thermionic, from carbon, **604**
    experiments on, use of radioactive Sr as tracer in, (**A**)**1906**
    from Pt, effect of impurities on, (**A**)**1926**
    from refractory materials, (**A**)**1927**
    simplified calculations for, (**A**)**1902**
    from thin oxide films, **1165**
    from thoria-rhenium, **2075**
  from transmitting-valve grids, **2935**
  work function of contaminated metal surfaces, (**A**)**1928**
——**gas**, hydrostatic pressure in, and interaction of electron beam and e.m. wave, (**A**)**1554**
——**guns**, for c.r. tubes, dimensional tolerances for, **2941**
  for electron microscope, **964**
——**lenses**, e.s., electron optics of, (**A**)**1476**
    focal length and chromatic aberration of, **1477**
    transgaussian rays in, **2314**
    3-diaphragm, theory of, **1213**
  e.s. and magnetic, ray tracing for, **966**
    in relativistic mechanics, **1478**
  immersion objective, field in, **1210**
  magnetic, calculation of, **2313**
    cylindrical, with image-distortion correction, **2312**
    focusing in, **200**
    lapping technique for, **1944**
  and mirrors, principal rays for families of, **1743**
——**microscope**, comparison with optical microscope, **2601**
  magnetic, work carried out with, **1474**
  new simplified models, **3119**
  and proton microscope, resolving power of, (**A**)**1476**
  R.C.A. Type EMC, modification to, **2003**
  Type EM2, design and construction of, (**D**)**431**
  3-stage, **1742**
    electron optics of, **965**
——**microscopy**, **433**
  contrast improvement in, **3117**
  practice of, **1741**
  review and bibliography, **432**
——**multiplication**, in crystals, **879**
——**multipliers**, (See also Photocells)
  applications of, **1815**
  microwave, 'multipactor', **494**
——**optics**, at h.f., and at relativistic velocities, **2001**
  of lens-type β-ray spectrograph, **2302**
  mapping of space-charge field in magnetron, **2315**
  potentials derived from axial values in, **2002**
  shadow technique for e.s. and e.m. fields, **199**, **967**, **1211**
——**plasma**, unstable oscillations in, **2764**
——**trajectories**, in alternating magnetic fields, **3021**
  automatic plotter for, **1718**
  dynamic tracer for, **1960**
  under space-charge conditions, **871**
——**transit time**, between coaxial cylinders, **1286**
Electronic applications, (See also Control; Heating; Instruments, electronic) aircraft fuel gauge, **1745**; blood-pressure recording, (**A**)**955**; brazing by pulse methods, **971**; device for calculation of product integrals, **1734**; differential vectorcardiograph, (**A**)**1467**; displacement measurement, **174**; displacement meter, electrical, **1993**; duplicator attachments for machine tools, (**A**)**1467**; flowmeter, (**A**)**1467**; gas-flow speedometer, **1195**; in industry, (**D**)**424**, survey, **709**; leak detector, **3074**; mapping of electrical activity of heart and brain, (**A**)**1467**; measurements on aircraft structures, **1736**; measurement of mechanical quantities, (**A**)**2306**, **2851**; multiplier-photocell detection of short light pulses, **3114**; piezoelectric acceleration meter, **413**; precision measurement of rotation speed, **417**, **951**; pressure measurement, **192**; reciprocator, **66**; resistance-welding control, **958**; r.f. welding control, **959**; rolling-mill control, **1996**; stimulator for biological research, **1206**; strain gauges, Types GM4472 and GM4473, **418**; temperature control, for furnace, **1991**, with thyratron, **2032**; thickness gauge for moving material, **2852**; vibration measurement, 20 c/s–20 kc/s, **706**
Electronics, in war and peace, (**A**)**191**
Electrons, slow, in polar materials, properties of, **1899**
Electrostatic field, effect on sphere or cylinder, **1127**
  measurement of, **927**
  time-variable, stroboscopic observation of, **2584**
——**repulsion**, radiation-pressure theory of, **2186**
Equalizers, a.f., design chart for, **1620**
  attenuation and delay, for coaxial lines, (**A**)**1619**
  for coaxial lines, (**A**)**2152**
  design charts for, **580**
  reactive, design of, **846**
Equipment design, using subminiature components, **1372**
Exhibitions, British Industries Fair, 1950, scientific instruments at, **2290**; B.S.R.A., sound reproduction, **2411**; components, Paris, 1950, **1371**; components and equipment, 1950 I.R.E. Convention, **2109**; Paris Fair, 1950, **3218**; Physical Society, 1950, **1883**; Radiolympia 1949, **145**; R.E.C.M.F., components, April 1950, **2159**; R.S.G.B., 1949, **1040**

F

Facsimile, comparison of modulation methods for radio links, (**A**)**1511**
Fault location, (See also Cables)
  by vibration testing, **924**
Feedback, calculator and chart for, **76**
  negative, in radio receivers, **449**
  positive, in amplifiers, **2463**
Ferroelectric materials, (See also Insulating materials)
  BaTiO$_3$, atomic positions and vibrations in lattice of, **3061**
    dielectric constant of, **1656**
    dielectric properties of, **2800**, at low temperatures, **1702**
    phase transitions in, **1703**
    piezoelectric effect in, **901**
    properties of, **663**, M.I.T. research on, **3064**
    single crystals, properties of, **1704**, **2250**
    symmetry changes at low temperatures, **374**
  crystals, properties of, **2794**
  electronic theory of, (**A**)**2474**
Ferromagnetic materials, (See also Alloys)
  alnico, time decrease of magnetic permeability in, **2483**
  anisotropic constant and law of saturation, **2232**
  Co, thermal variation of coercive field, **2235**
  coercive force, of powdered MnBi, **670**
    of powdered Mn$_2$Sb, **661**
  Cu/Mn/In and Cu/Mn/Ga alloys, **658**
  departure from Rayleigh's law of magnetization in, **3029**
  effect of annealing on residual magnetization of, **2233**
  electrolytic iron, **382**
  factors affecting properties of, **2234**
  Fe/Co, effect of tension on, (**A**)**2534**
  Fe/Cr and Fe/V alloys, antiferromagnetism of, **2236**
  ferrites, **659**
    anomalous dielectric constant of, **1932**
    anomalous expansion of, **2533**
    Co, properties of, **1168**
    Co/Zn and Mn/Zn, **1699**
    Cu, properties of, **2786**
    dispersion in, theory of, (**A**)**2487**
    ferroxcube, **371**
    g-factors of, **1930**
    Mn, properties of, **2239**, resonance absorption in, **2484**
    Mn and Co, preparation and properties of, **1698**
    Mn/Zn, magnetic viscosity in, **373**
    Ni, properties of, (**A**)**2529**, resonance absorption in, (**A**)**2485**
    Ni/Zn, **2530**, molecular field of, **1170**, properties of, **905**, saturation magnetization of, **1171**
    properties of, **2528**
    rare-earth, **2532**
    saturation magnetization of, **1166**, **1931**
    spontaneous magnetization of, **1167**, **2531**
    theory of, **2238**
    for use at h.f., **660**
  growth and effect of oriented crystals in, **2769**
  hiperco, magnetostriction properties of, **2790**
  Ni/Co and related alloys, properties of, **903**
  Ni/Fe alloys, hysteresis asymmetry for, **662**
    propagation of Barkhausen discontinuities in, **1903**
    ternary, physical relations for, **657**
    50%, oriented, properties of, **372**
  permalloy, macroscopic magnetic structure of, **906**
  permanent-magnet alloys, structure and properties of, **908**
  powders, apparent permeability and Q at h.f., **2787**
  properties at cm λ, **1173**
  Pt/Fe alloys, properties of, **2788**
  Pt/Mn alloys, properties of, **2789**
  saturation and magnetic hardness of, **2231**
  Si-Fe and Ni-Fe laminations, after-effect in, **904**
  temperature coefficient of resistivity of, **1696**
  transformer laminations, theory of inhomogeneous surface layers in, **3060**
Ferromagnetism, domains, fringe fields of, **1212**
    theory of, **1129**
  I.E.E. symposium on, (**AD**)**370**
  in metal compounds, conditions for, **656**
    theory of, **2237**
Field contours, electron-optical shadow technique for e.s. and e.m. fields, **199**, **967**, **1211**
——**plotting**, by fluid flow, **154**
——**strength**, (See also Television; Wave propagation, e.m.)
  measurement, at h.f., **139**
    near Geneva for 93-Mc/s f.m. transmissions, **984**
    at v.h.f., influence of the ground on, **2284**
  survey for WTTG, Washington, **2050**
  v.h.f., standards of, **3090**
Films, (See also Sound recording; Sound reproduction)
  thin, Ag, detector properties of, **2536**, resistance of, **2242**
    ferromagnetic, magnetization of, theory of, (**A**)**2486**
    metal, heating by alternating magnetic field, **1671**, resistance variation with applied potential, **2535**, resistivity of, **1430**, (**D**)**1431**, resistivity formula for, **1175**, resistivity at low temperatures, **1701**
    PbS, PbSe and PbTe, structure of, (**A**)**2537**
    PbS, photosensitive, properties of, (**A**)**2538**
    uniform, production by evaporation, **3063**
Filters, (See also Networks; Quadripoles)
  a.f., using cathode-coupled flip-flop circuits, (**D**)**1106**
    continuously variable, **2691**
    low-pass and high-pass, adjustable, **2744**
  band-pass, dissipative, design of, **2153**, design formulae for, **1099**
    h.f., **3000**, 3-stage, with variable bandwidth, **843**
    microwave, coaxial-transmission-line, **1368**, spurious modes in, [illegible]
    modulation distortion by, **844**
    phase-shift, **1881**
    4-element, impedance transformations in, **312**
  characteristic impedance of, **578**
  crystal, band-pass, lattice, **842**, with variable selectivity and constant gain, **2740**
  graphical design of, **577**
  ladder, classification of, **575**
    microwave, wide-band, **1365**
  lattice, design of, **2998**
  LC, h.f., design of, **845**
  low-pass, for elimination of television interference, **1367**
    iterative, transfer abacs for, **576**
  mode, ring, for Type H$_{11}$ waves in circular waveguides, **2420**
  multiple-resonant-circuit, minimum unloaded resonant-circuit Q for, (**A**)**1355**
  phase-shift calculation for, **1623**, **1624**
  power, error-actuated, **57**
  for protection of carrier signals on distribution systems, **579**
  radio, and recurrent networks, **2999**
  RC, π-mesh, admittance and transfer functions of, **1622**
    passive, adjustable, design of, **2739**
  recurrent, generalized formula for, **311**
  r.f., mechanical, **59**
  simple theory of, **1100**
  theory of, simplifications in, **316**
    and Tchebycheff polynomials, **569**, **2997**
  theory of band-pass/low-pass analogy, **61**
  transient response of, **60**, **2741**
  transients in, calculation of, **2154**
  wave, physical basis of, **2197**
  waveguide, low-Q, **2742**
    tunable, (**A**)**1355**
    wide-band, design of, **2743**
Fleming, Ambrose, life and work of, **1043**
Flicker effect, and semiconductor noise, **3035**
Fluctuations, (See also Noise)
  as oscillations of random amplitude and phase, **1834**
  spontaneous, in double-cathode valves, (**D**)**791**, (**D**)**1035**, (**C**)**1831**
Fluorescence, trivalent cations in fluorescent ZnS, **2228**
  of ZnS-Cu, **1425**
Fluxmeter, e.s., with short response-time, [illegible]
Frequency, (See also Standard frequency)
  allocation, for broadcasting stations, technical repercussions of Copenhagen conference, **2343**
    for mobile radio communication services in U.S.A., **228**, **742**
    Provisional Frequency Board, **1245**
  analysis, spectrometer for, **406**
  changers, Ge-crystal-tetrode, **2332**
    magnetic-cross, for subharmonic generation, **2727**
  control, automatic, for power oscillators, **705**, for unattended transmitters, **1280**
    for bevatron r.f. voltage, (**A**)**3116**
    with variable-capacitance valve, **2939**
  conversion, improved method of, (**A**)**1501**
    by phase variation, **1759**
    supply frequency to h.f., by means of valves, **827**
  converters, high-gain, for 50–58 Mc/s, **219**
    modulation, use in pulse multiplex equipment, **2024**
    radioteletype, carrier-shift, common-frequency, (**A**)**1501**, testing of, (**A**)**1454**
  dividers, multivibrator, high-ratio, **588**
    u.h.f., **1113**
  division, with RC oscillators, **2166**
  doubler, aperiodic, using titanate capacitor, **1384**
  measurement, absolute, P.T.R. equipment during 1936–1945, **408**
    a.f., stroboscopic, **1842**
    unequivocal, by comparison with standard, **2828**
  meter, and applications, **161**
    0–0.2–2–20 kc/s, **160**
  stabilization, simplified, for microwaves, **773**
    with spectral lines, **2140**
  standards, adjustment of, **1447**
    WWVH transmitting station, **747**
  synthesis and measurement, **1961**
  varying, measurement of, **1462**

G

Galactic radiation, r.f. See Cosmic noise.
Galvanometers, sensitivity of, **151**
  theory of, **2283**
Generators, (See also Oscillators; Signal generators)
  e.s., Van de Graaff, 800-kV, at Uppsala, **2000**
  harmonic, microwave, using Si crystals, (**A**)**1355**
  h.v., cascade, h.f. filament heating for, **1527**
    square-wave, **851**
  pulse, for biological studies, **1887**
    using permalloy-core coils, **1351**
    with variable pulse width, **853**
  sawtooth, high-power, using synthesis of square waves, **1883**
  sinusoidal-voltage, 20 c/s nearly to zero, **2293**
  square-wave, applications of, **2579**
  ultrasonic, Hartmann, **2956**
    magnetostriction, output formulae for, **2684**
Geomagnetic storms, development of, **2501**
  and solar activity, 1949, **1910**
  24th–26th Jan. 1949, recurrence features of, **93**
  Jan.–June 1949, **623**, April–Sept. 1949, **1143**, Oct. 1949–March 1950, **2500**
Geomagnetism, and earth's interior, **1679**
  effect of earth's compressibility on, **2209**
  field strength at great altitudes, **2497**
  generalization of Wilson's hypothesis on, **2203**
  magnetic disturbances, international data, for first quarter 1949, **620**, for second quarter 1949, **1140**, for fourth quarter 1949, **2498**
  K-index at Eskdalemuir, 1940–1947, **622**
  K-indices, Cheltenham, April–June 1949, **621**, July–Sept. 1949, **1141**, Jan.–March 1950, **2499**
  sudden commencements, dependence on local time and geomagnetic longitude, **1142**
Geophysical data, practical determination of daily variations in, **636**
Geophysics, bibliography of, **610**
Goniometer, X-ray, double-crystal, **3053**

H

Harmonic analysis. See Waveform analysis.
Hearing, (See also Audiometer; Audiometry)
  aids, American, **807**
    Austrian, **24**
    crystal earpiece for, **1335**
    e.m. earpiece for, **1574**
  calculation of hearing loss from audiogram, **1065**
  frequency selectivity of ear, **2692**
  interaural phase effects on binaural threshold, **11**
  masking of tones and speech by noise, **1063**
  sensation produced by square waves, **2402**
  test methods, development of, **1327**
  upper frequency limit for, **2959**
Heating, dielectric, in foundry work, **423**
    h.f., **2854**, in wood industry, **2307**
    of nonconductors, physical principles of, **954**
    of nonhomogeneous bodies, temperature variation in, **189**
  h.f., coupling circuits for, **186**
    output coupling of oscillators for, **1376**
  induction, applications of, **707**
    brazing by pulse methods, **971**
    d.c./a.c. conversion for, **952**
    furnace for high-temperature ceramic research, **187**
    for hardening, **188**, (**C**)**422**, **953**
    h.f., **1995**
    for rapid tempering of steel, **3113**
    r.f., applications in non-ferrous metal industry, **421**, for forging shop, **420**, **1735**, furnace for, **419**, of small parts, **1994**
    theory and design of m.f. furnaces for, **3112**
Heaviside, and the Heaviside layer, **2392**
  I.E.E. Centenary Meeting, **2391**
High voltage, (See also Generators)
  regulation by corona discharge, (**A**)**1596**

I

Impedance, (See also Aerials; Transmission lines)
  acoustical, of loudspeaker housings, **1851**
  matching, by compensated exponential lines, **1583**
    with exponential line, **1095**
    of feeder for given frequency, **2149**
    graphical methods for, **2150**
    for long-distance telephony equipment, **1766**
    networks for, **1614**
    with tapered coaxial line, **2421**
    v.h.f., meter for, **2837**
    wide-band, [illegible] **1361**
    for 2-band aerials, **34**, **1338**
  measurement, for circuit shunted by negative-resistance element, **934**
    concentric-line apparatus, effect of discontinuities in, **1183**, (**D**)**2335**
    using c.r.o. as indicator, **2279**
    for dielectrics at u.h.f., graphs of $\tanh x/x$, **935**
    with directional coupler and probe, **155**, **949**
    with directional coupler at u.h.f., **1720**

    - for dm and cm waves, 398
    - microwave, accuracy of, 3093
  - meter, dm-λ, direct reading, 2286
  - transformer, wide-band, for coaxial line and helix, 1612
- **Inductance** measurement, by detuning methods, 143
  - self and mutual, of spherical shell within infinite solenoid, 2766
  - standards, stability of, 926
- **Inductors**, calculation and losses of, (A)1355
  - decade, 81
  - h.f., 1875
- **Infra-red** image-converter tube, 193
  - radiometer, diaphragm-type, 2847
  - rays, demonstrations with, 696
  - spectrometer, c.r. tube presentation for, 177
- **Installation**, of radio instruments in aircraft, 752
- **Instruments**, circular-scale, operation and care of, 146, 402
  - electrical, double-moving-coil, 685
  - electronic, (See also Electronic applications)
    - in atomic research, (A)1998
    - for chemical laboratories, 710, 2308
    - for diagnostic medicine, 1207, (D)2588
    - for rocket range, (A)1467
    - at S.I.M.A. symposium, Nov. 1949, 956, 957
  - indicating, ratio of electrical to frictional torques in, 149
  - for nucleonics, desirable improvements in, (A)955
  - r.m.s., diotron, 2570
- **Insulating materials**, (See also Ferroelectric materials)
  - butyl, for encasing small transformers, 2802
  - ceramic, alkaline-earth titanates, properties of, 911
    - $BaTiO_3$, Lorentz correction for, 2188
    - Ca/Ba titanates, properties of, 1709
  - effect of moisture on, 3066
  - electronic processes in, 1428
  - glass, electrical conduction in, 2801
    - power factor as function of composition of, 3075
  - paper, dielectric investigations on, 3067
    - power-factor measurement for, 144
  - plastics, ethoxyline resins, Araldite, 126
  - plastics and silicones, (A)119
  - polar, properties of slow electrons in, 1899
  - silicone rubbers, 127
  - silicones, properties and applications of, 1176
  - solid, conduction and breakdown processes in, 1429
  - titanates, with high dielectric-constant, 120
    - theory and properties of, 1942
  - titanates and zirconates, ferroelectric properties of, 2548
  - wire coverings and sleeving for Service equipment, 2245
- **Insulation** improvement, by application of organosilicon compounds, 3066
    - by application of quaternary NH_4 compounds, 3066
- **Interference**, co-channel, reduction by aerial phase control, 2655
  - from fluorescent tubes, 1509
  - f.m., (A)1501
  - from h.v. systems, 3152
  - in region between two f.m. common-wave transmitters, 990
  - from r.f. heating equipment, 2620
  - suppression, for h.f. induction-heating oscillators, 1508
    - by off-frequency inversion, 1506
    - for receiving aerials, 1586
    - for small motors, 1763
    - work of E.R.A., 1240
  - in television, adjacent-channel, 2653, and co-channel, 1798
    - from amateur transmitters, 1279, 1367, 1547, 2156
    - causes and suppression of, 1277
    - channel allocations for reduction of, 258
    - and fading effects, reduction of, 1278
    - filters for suppression of, (A)1355
    - from h.v. systems, 3152
    - illustrations of, 2920
    - from incandescent lamps, 771, (D)2051
    - suppression in 10-m transmitter, 2053
  - from television receivers, 1510
- **Interferometers**, waveguide, Michelson-type, for microwave measurements, 162, 163, 845
- **Ion guns**, comparative survey of, 416
- **Ionosphere**, (See also Absorption; Atmosphere; Wave propagation, e.m.; Waves)
  - absorption, approximate solution for, (D)2502
    - in parabolic layer for vertical incidence, 627
    - at 150 kc/s, diurnal variation for vertical incidence, 2503
  - anomalies, and solar flares, (A)1411
  - critical frequencies deduced from radiotelegraphy observations, 1753
  - diffusion in, 1150, (A)2505, 3045
  - drift effects for rapid echo fluctuations, 3144
  - effects of solar flares in 1948, 619
  - E layer, effect of sun on, 1682
    - electron production in, 628
    - irregularities in, (A)1409
  - E_s layer, frequency of occurrence and structure of, 1915
  - F layer, oscillations of, correlation with surface pressure, 1683
    - recombination coefficient of, 889
    - sunrise effects in, 633
    - tidal effects in, 634
    - travelling disturbances in, 2504
  - F_2 layer, critical-frequency recordings, Rome, Sept. 1948–March 1949, 1684
    - diurnal variations of ionization at equatorial stations, 1681
    - height and relative sunspot number, 890
    - lunar variations at low-latitude stations, 635
    - nocturnal ionization in, 1148
    - observations during solar eclipse, May 1947, 1147, 1914
    - parabolic-model data for, 2775
    - stratification over Singapore, 1151
    - thermal expansion of, 440
    - true heights of, 629
  - forecasts and radio communication, 1754
  - geometrical optics of, 717
  - (h', f) records, analysis of, 1152
    - at Spitsbergen, (A)1415
  - ionic double-refraction theory, 1752
  - ionic processes in, (A)613
  - ionization in, (AD)95
  - ionization distribution in, 889
  - layer formation in, 1146, (A)1406
    - theory of, 1407, 2211
  - layer heights, measurement of, 888, in Germany, 892
  - reflection of 50-kc/s pulse signals, 2506
  - research, mathematical problems in, (AD)632
    - at Pennsylvania State College, (A)631
    - by U.S. Air Force, (A)630
  - review for 1949, 1145
  - scattered echoes near F_2 critical frequencies, 1487
  - sporadic-E clouds during auroral display, 3046
  - sporadic-E ionization, amateur co-operation in study of, 2212
  - sporadic-E layer, large-scale movements of, 3044
    - June/July 1949, 1222
  - sporadic-E reflections, and meteor-trail echoes, 2774
  - sporadic ionization at high latitudes, (A)725, 1224
  - storms, analysis of, 891
    - warning service, 2321
  - and troposphere, cellular atmospheric waves in, 1680
  - and weather forecasting, 1153
  - winds, radio measurements of, 96
- **Ions**, positive, emission of, 3074

K

- **Keying**, electronic, 1281
  - square-wave, of oscillators, 1286

L

- **Laboratory**, Laboratoire central d'Électricité, Fontenay-aux-Roses, 2106
  - R.A.F. calibration centre, 1186
  - research, of British Electricity Authority, 3153
  - Saint-Cyr, for study of materials under tropical conditions, 676
  - h.v., General Electric, 136
- **Lamps**, fluorescent, oxide cathodes for, study of, (A)2055
- **Lenses**, (See also Electron lenses)
  - microwave, delay, electrolyte-tank measurements for, 2833, metal-strip structure for, (C)290, theory of, 1088
    - metal, diffracted beams in, (A)1338
    - metal-plate, wide-angle, optics of, 1345
    - theory of, (A)1338, 2765
    - wide-angle, 2723
- **Light**, velocity of, measurement of, 1896, 2759
- **Loudspeakers**, (A)1319
  - baffles for, 2120
  - combination, 2409
  - damping and transient response of, 1852
  - damping variation with constant output level, 1070, (D)1336, (D)1337
  - duo-cone, 17, 1069
  - horn, with subdivided throat, 2408
  - housings for, (A)1319
    - acoustical impedance of, 1851
  - for miniature radio receivers, (A)1319, 1760
  - phase shift in, 2698
  - receiver, acoustic measurements on, 2958
  - for remote collective farms, 16
  - underground, for use in stadia, 18, 19
  - for 5–20 kc/s, 806
- **Luminescence** phenomena, interpretation of, 103
  - of ZnS-Ag, poisoning of, 2793

M

- **Magnetic field**, comparator for measurement of, 2830
  - effects of, Hall effect in composite conductors, 3026
  - electron-optical mapping of, 1212
  - intense, pulse method for, 90
  - of large electromagnet, stabilization of, 1531
  - of massive rotating bodies, 1139, (D)2204, 2205
  - of variable stars, 2771
- ——**force**, practical calculation of, 1662
- ——**materials**, (See also Alloys; Ferromagnetic materials)
  - for electrical power plant, (A)113
  - fired earths, demagnetization by reheating, 1169
    - remanence of, 902
  - permanent-magnet alloys, preferred domain orientation in, 2241
  - for permanent magnets, phase conditions of, 669
  - powders, effective permeability and Q of, 1172
  - survey of developments in, 3076
- ——**measurements**, of core loss for Si-steel strip, 683
- ——**properties**, after-effect, in Rayleigh domain, 1660, 1661, theory of, 1659
    - revealed by a blow, 2230
  - of Pd alloys, 1174
  - of stainless steels, 2527
- **Magnetism**, eddy-current anomaly, theory of, 353
- **Magnetometer**, airborne, for measuring earth's total field, 697
  - saturable-core, recording, 2276
    - 3-component, 925
- **Magnetostriction**, of anisotropic permanent-magnet alloys, 129
  - in Fe/Co and Fe/Si alloys, (A)2551
  - in Fe/Ni alloys, 1697
  - measurement with strain gauge, 2492
  - properties of hiperco, 2790
- **Magnets**, permanent, magnetic circuits for, 3072
    - stability of, 2251
    - stabilized, 2549
    - in torque-transmission devices, 50
- **Mathematics**, bilinear transformations, application to tuning of output stage, 80
  - calculus, operational, Heaviside's, (A)2257, 2258, and Schwartz functions, (A)1182
  - circular and hyperbolic functions in electrical engineering, 1439
  - differential equations, numerical integration of, 1712
    - quasiharmonic, stable periodic solutions of, 1440
    - Schrödinger's, sampling method for eigenvalues of, 3079
    - $y''-xy=f(x)$, solution of, 2556
  - Fourier and Mellin transforms of inverse Bessel functions, 2553
  - Fourier series, summation by Laplace transforms, 1948
  - Fourier transforms, and transit-angle functions, (D)1832
  - function $\mathrm{Gi}(x)=(1/\pi)\int_0^\infty \sin(ux+\frac{1}{3}u^3)du$, tabulation of, 2552
  - integral $I=\int_{x_1}^{x_2} f(x)e^{i\phi x}dx$, evaluation of, 2552
  - Laplace's equation, separation of variables in, 2260
  - Laplace transformation, and summation formulae, 2555
    - and transient phenomena, 914
  - matrix methods for solution of network problems, 2440
  - non-integral Legendre functions, application to potential problems 384
  - oblate spheroidal wave functions, 2259
  - potential functions, for a particular valve, 487
  - and radio technology, 1438
  - smoothing and prediction theory for stationary time series, 1713
  - variational method for studying wave equation, 3080
  - Weber's function, 385
  - WKB approximation and Hill's equation, 2554
- **Matter**, as a mode of motion, 3018
- **Measurements**, (See also individual subjects)
  - a.f., 138, 147, 148
  - electrical, using valve amplifiers, 2826
  - electronic, recent improvements in technique of, (A)1998
  - r.f., 1187
  - u.h.f., apparatus for, 2569, 3088
- **Mechanics**, linearization of nonlinear systems, 1393
- **Metallization**, of paper tape for capacitors, 123
- **Metallurgy**, powder, sintering of iron powders, 130
- **Meteorology**, (See also Radar applications)
  - and radar echoes, 3041, 3042, (D)3043
- **Meteors**, echo method for height of reflecting point of trail, 1692
  - radio methods for investigation of, (A)356, (A)613
  - speed of, radio Doppler measurement of, 1907
  - trail echoes, and sporadic-E reflections, 2774
- **Microphones**, capacitor, miniature, Type 21B, (A)1319, 1849
  - carbon, nonlinear distortion in, 2964
  - crystal, for underwater sounds, 2689
  - directional, 15
    - using phase-shifting elements, 2967
  - KB-3A, high-fidelity, noise-rejecting, 1567
  - pressure, ribbon, 2697
  - reciprocity calibration of, 10, 1060
  - sensitivity and fidelity of, 538
  - underwater, 2119
  - velocity, bantam, Type KB-2C, 805, 1850
- **Microwaves**, (See also Measurements; Wave propagation, e.m.)
  - biological effects of, 425
  - intense, biological effects of, (A)1467
  - transmission efficiency measurement for, 684
- **Missiles**, guided, German, accelerometers for, 753
- **Mixers**, microwave, using Si crystals, (A)1355
- **Modulation**, amplitude and frequency, simultaneous, 3158
  - f.m. to a.m. conversion in waveguide, 2896
  - folded-sideband, 1520
  - frequency, wide-band, time delay and distortion in, (A)1454
  - measurement, for television signals, 172
  - meter, 3098
  - microwave, by variable waveguides or cavity resonators, 3186
  - monitor, for television transmitters, 785
  - outphasing system of, 229
  - product-phase, and demodulation, (A)1511, 3159
  - pulse, 459, 1769
    - for multichannel radio links, 3166
  - pulse-code, 1519
    - and distortion with logarithmic sampling, 1003
    - methods of, (A)1511
  - pulse-duration, asymmetrical, 230
  - pulse-frequency, theory of, 461
  - pulse-time and pulse-width, 2344
  - pulse-width, distortion in, 1771
  - reactance-valve, of phase-shift oscillators, 1022
  - of reflex klystron, 2370
- **Modulators**, class-B, for high-power transmitters, 480
    - using Type-807 valves, 479
  - frequency, crystal-controlled, 2925
  - magnetic, limitations for d.c. amplification, (A)1599
  - magnetron, matching circuits for, 552
  - with nonlinear inductors and capacitors, 478
  - pulse-width, development of, 854
  - reactance-valve, for a.f. beat-frequency oscillator, 590
  - rectifier, balanced, without transformers, 1632
    - with frequency-selective terminations, 260, (D)2871
    - nonlinear effects in, (D)1552, 1633, (D)2167
    - ring, for multichannel telephony, 1025
  - for television, 1259
  - producing 10^6 0.1-μs pulses/sec, (C)69
- **Monitoring**, continuous, for fault location in transmission equipment, 994
  - of radio transmissions for naval and aviation purposes, 166
- **Monitors**, for television transmissions, 2290
- **Moon**, 24-kMc/s radiation from, 612
- **Motors**, synchronous, low-power, 2635
- **Multivibrators**, asymmetrical, 1110
  - cathode-coupled, theory of, 2454
  - tuned-anode, 2165
- **Musical instruments**, electronic, Hammond spinet, 426

N

- **Navigation aids**, (See also Radar)
  - aerial, at Buenos Aires airport, 2781
    - definitions of terms, I.R.E. standard, 650
    - distance-measuring equipment, 102, 645, 896, pulse-multiple system for, 365, 100-channel, traffic capacity of, 1918, 2780, 1000-Mc/s airborne transmitter for, (A)1416
    - errors in, (A)1416
    - improvements in, 646
    - instrument landing system, 2782, Type ILS-2, 2513, Type SCS51, 2512
    - l.f., effects of sky wave on operation of, (A)1489
    - microwave landing system, 2783
    - phase-measurement methods, phase anomalies in, 2516, source of error in, 2515
    - pictorial display for traffic-control zone, 1694
    - rotating-field beacons, 649
    - Sperry automatic pilot, Type A-12, 2317
    - for U.S. aircraft, 1161
    - v.h.f. omnidirectional radio range, course errors in, (A)1416, flight testing of, 2224
    - work of R.T.C.A., 1920
    - 335-Mc/s equisignal glide slopes, 2514
  - marine, loran indicator, direct-reading, 1160
  - m.f., effects of sky wave on planning of, (A)1490
- ——**systems**, aerial, considered at C.E.R.C.A. conference, 2225
    - Oboe, 647
    - pulse, 648
    - radio, common principles of, 1919
  - and detection systems, analysis of, (A)1416
  - relations between speed of indication, bandwidth and signal/noise ratio, 364
- **Networks**, (See also Circuit theory; Filters; Impedance; Quadripoles)
  - angular-modulation, distortion and bandwidth relations in, (A)1355
  - bisection theorem for, 54
  - bridged-T, and properties of, 2446
  - constant-phase-shift, (D)1093, 1359
  - delay, with maximally flat characteristics, 310
  - direct measurement of bandwidth of, 1608
  - f.m., admittance of, 309
  - with given frequency characteristics, construction of, 1878
  - impedance-matching, 1614
  - insertion attenuation functions, synthesis of, 2151
  - ladder, inductively coupled, 1357
  - λ/4, 579
  - lattice, phase shift in, 1618
    - RC, synthesis of, 1605
  - linear, response to arbitrary stimulus, 1364
    - use of method of nodal equations, 1096
  - linear and nonlinear, determination of transfer functions by electronic correlator, (A)1441
  - multipole, theory and technique at u.h.f., 1882
  - n-mesh, analytical conditions for damping in, 839
  - passive, synthesis of, 82
  - phase-shifting, design for RC oscillators, 840, (D)1621
  - phase-splitting, wide-band, design of, 2736
  - problems of, solution by matrix methods, 2440
  - quadripole, with dual iterative impedance, 1615
    - relation between parallel and star connection, 2146
    - resistanceless, passive, synthesis of, 1879
    - with specified impedances, 838
    - synthesis of, 1616
  - recurrent, and radio filter circuits, 2999
  - synthesis of, approximation problems in, 2442
    - for prescribed transient response, 1604
  - theorem on, 305, (D)833
  - theory of, 1097
    - basis of, 1609
    - use of matrix calculus, 1876
  - transient and steady-state responses of, reciprocal relation of, 1880
  - transients in, distortion of, 1101
  - with transmission-line coupling, theory of, 318
  - variable, frequency analysis of, (A)1355, 1617, (C)2737
    - impulse response of, 2738
  - 2-phase, wide-band, synthesis of, 1856
  - 2-pole, lumped-constant, transformation to dissipative lossless transmission line, 2147
  - $2n$-pole, theory of, 313
- **Noise**, (See also Cosmic noise; Fluctuations; Solar radiation; Valves)
  - in a.f. systems, (A)1319
  - in aircraft, effect on telephony, 1328
  - background, a.f., 2399
  - contact, theory of, 1391
  - in current-carrying resistors, 2141
  - electrical, measurement of, 969
  - figure and conversion loss measurement for microwave receivers, 677
  - fluctuation, in dielectric materials, 2550
    - spontaneous, in double-cathode valves, (D)791, (D)1035, (C)1831
  - f.m. hum in r.f. signal, measurement of, 3102
  - impulse, suppression of, 458
  - measurement, for cm-wave amplifiers, 930
  - objective measurement of, 1059
  - reduction, in sound-film recording, by use of delay networks, 1856
  - resistor, 1465, 2295
    - effect of dimensions, 1601
  - in semiconducting contacts, (A)240
  - in semiconductors, and flicker effect, 3035
  - in sound recording and reproducing systems, (A)1319
  - source, microwave, wide-band, 929
  - spectrum, video-frequency, analyser for, 165
  - statistical prediction of, 2755
  - suppression, in triode amplifiers, 2751
  - thermal, at high frequencies, 2334
  - ultrasonic, generation and analysis of, 1064
  - valve, and electron transit time, (D)1308
    - at very low frequencies, (A)2064
  - valve-grid, induced, 1833, and noise factor, 1567
- **Nuclear physics**, (A)1392

O

- **Optical systems,** Schmidt, aberration of, **347**
    - corrector-plate design for, **346**
    - field-flattened, aberrations of, **1655**
    - wide-angle, design of, **3020**
- **Optics,** interference fringes near caustics, **344**
  - schlieren method, improvement of, **2760**
- **Oscillations,** Barkhausen, in magnetrons, theory of, **67**
  - harmonic and subharmonic, in nonlinear systems, **847**
  - h.f., synthesis from l.f. oscillations, **560**
  - in long dielectric cylinder, **1130, 1131**
  - microwave, generation and amplification with travelling-wave valves, **3004**
  - plasma, and dispersive power, **2482**
    - effects of plasma boundaries in, **3027**
    - in hot-cathode discharge tubes, **495**
    - theory of, **88, 89**
  - relaxation, generalized van der Pol equation for, **2994**
    - in glow discharge tubes, **351**
    - theory of, **2261, 2995**
  - steady-state, theory of, **869**
- **Oscillators,** a.f., beat-frequency, warbler for, **590**
  - blocking, for telemetry, (**A**)1355
    - as variable-frequency sources, **327**
  - cathode-coupled, frequency and amplitude stability of, **1884**
  - class-C, transient behaviour of. (**A**)1355
  - crystal-controlled, **1375**
    - high-stability, **1107,** (**C**)1629
  - f.m., variable-phase-shift, **325**
    - wide-range, **1980**
  - h.f., high-power, for industrial use, **1381**
  - of high frequency-constancy, **848**
  - klystron, for 600–7000 Mc/s, **2164**
  - LC, variable-frequency, stability of, **2450**
  - l.f., bridge-stabilized, frequency stability and parasitic oscillations in, [illegible]
  - locking in integral and non-integral frequency ratios, **2578**
  - microwave, with resonant load, frequency contours for, **317**
    - r.f. phase control in, (**A**)1355
  - negative-grid, electron transit time in, **3002**
    - transit-time effects in, **1820,** (**D**)2384
    - 100–1000 Mc/s, feedback in, **2451**
  - phase-shift, **324,** (**D**)1378, (**C**)1628
    - reactance-valve modulation of, **1022**
    - with very tight coupling, **587**
  - plasma, u.h.f., **1108**
  - van der Pol, energy fluctuations in, **63**
  - quasi-sinusoidal, synchronization of, **1349**
  - RC, calculation of, **2163**
    - design of, **1379**
    - phase-shifting network design for, **840,** (**D**)1098, (**D**)1621
    - use for frequency division, **2166**
  - reactance-valve, **326**
  - reflex-klystron, wide-band, mode suppression in, (**A**)1355
  - relaxation, transitron, **852, 1380**
  - scales for, calibration of, **2825**
  - sine-wave, nonlinear, design of, **323**
  - square-wave keying of, **1285**
  - transitron, **586**
  - triode, using coaxial-line circuits, for dm λ, **850**
    - limiting frequency of, **3003**
    - u.h.f., with series-tuned circuit, **2452**
  - u.h.f., **1109**
    - using disk-seal triode Type 2C40, **1033**
    - with frequency sweep, **2294**
    - multi-valve, using annular resonators, **1885**
  - ultra-low-frequency, 0.1–0.02 c/s, **968**
  - valve, pulling-in range for control by harmonic, **585**
  - variable-frequency, high-stability, **1627**
    - stabilized, high-accuracy, **1464**
    - wide-range, (**A**)1355
  - 3–11-kMc/s, using buzzer, **2581**

P

- **Particle accelerators,** (**A**)1467
  - betatron, circuits for, **429**
    - with and without iron yoke, **1209**
    - theory of, **3084**
    - 6-MeV, experiments with, **2856**
    - 300-MeV, 80-MeV model of, **2593,** performance of, (**A**)2594
  - bevatron, frequency control for r.f. voltage of, (**A**)3116
  - cosmotron, 3-kMeV, **1738**
  - cyclosynchrotron, **1737**
  - cyclotron, **198, 1472**
    - Berkeley, 184-in., focusing of proton beam of, **2800,** operation of, **962**
  - for electrons, radial oscillations in, **2592**
  - ion source for, **2855**
  - linear, design of TM_{010} cylindrical resonators for, (**A**)2590
    - and synchrotrons, **428**
    - 200-kV, with gas-recovery system, (**A**)2589
  - omegatron, **2310**
  - particle injection for, **1471**
  - phase focusing in, **1208**
  - proton synchrotron, **2309**
  - r.f. problems of, (**A**)1467
  - synchro-cyclotron, field regulator for, (**A**)1467
  - synchrotrons, betatron-started, **195, 1739,** capture process in, **2599,** λ/4 coaxial-line resonators for, **430**
    - Berkeley, r.f. system of, **2598**
    - particle capture in, **960**
    - pole-face design for, **1473**
    - racetrack design of, (**A**)2597
    - at Royal Cancer Hospital, London, **196**
    - with straight sections, dynamics of, **197**
    - 14-MeV, electron capture and phase stability in, **961**
    - 30-MeV, extraction of beam from, **2857**
    - 350-MeV, M.I.T., electron-injection gun for, (**A**)2596, operation of, (**A**)2595
- **Perveance,** unit of, **498**
- **Phase** discriminators, diode, **566**
  - measurement, for cm-wave circuits, **682,** 1721
    - with c.r.o., **1965**
  - meter, a.f., **1190,** wide-band, **1724**
    - direct-reading, (**A**)1454, **2289**
    - electronic, **163**
    - h.f., direct-reading, with c.r.o. indicator, **2574,** with pointer indicator, **3101**
    - for range 100 kc/s–20 Mc/s, **1725**
- **Phosphorescence,** in crystals, mechanism of, **2181**
- **Phosphors,** (Ba, Sr)O, luminescence of, **653**
  - $CaSiO_3$, optical properties of, **107**
  - dielectric changes in, **367**
  - emission spectra of, **3056**
  - infrared-sensitive, rise in brightness of, **368, 3057**
  - optical properties of, **104**
  - polycrystalline, scattering and absorption of luminescence light in, **2470**
  - for scintillation counters, (**A**)955
  - SrS-Zn, **2521**
  - sulphide, emission bands of, **1163**
    - luminescence of, **1162**
    - luminescence extinction by electric fields, effect of temperature, **1164**
  - willemite, fluorescence efficiency of, **105**
  - X-ray investigation of, **2227**
  - Zn and Zn-Be silicates, fluorescence in, **106**
  - (Zn, Be)$_2$ SiO_4-Mn, variation of emission spectrum with decay time, **2522**
  - ZnF_2-Mn, cathodoluminescence efficiency and decay of, **108**
    - properties of, **2792**
  - ZnO, effect of ZnS on luminescence of, **2523**
  - ZnS, activation by Na and Li, **109**
    - luminescence-extinction effect of Ni and Co on, **2524**
    - trivalent cations in, **2228**
  - ZnS-Cu, fluorescence of, **1425**
    - formation of fluorescence centres in, **2229**
  - ZnS-Pb, luminescence of, **110**
  - ZnS-Sn, luminescence of, **654**
  - Zn_2SiO_4, rise and decay of luminescence of, **3058**
- **Photocells,** applications of, **194**
  - electron-multiplier, **2929**
    - design of, **2663**
    - high-sensitivity, **2085**
    - pulse rise-time in, **2664**
    - R.C.A. 931A, pulse distribution in, **2056**
    - for scintillation counters, **1198**
  - image-converter, for high-speed shutter, (**A**)1467
  - PbS, photoconductive, in sound reproducers, **1027**
  - phototransistor, **2930**
  - resistance, Ge, **778**
  - Se, constitution and mechanism of, **3199**
  - Type CE-70V, **1288, 2928**
- **Photoconductivity,** of amorphous Se, **2519**
  - of Bi_2S_3 and Bi_2Te_3, **1424**
  - of infrared-sensitive semiconducting films, theory of, **2789**
  - of PbS, **369, 1923**
- **Photoelectric effect,** in Ge, **1924**
- **Photoelectricity,** photoadsorption of thin layer of Ba, **3030**
- **Photography,** aerial, automatic exposure control for, **1999**
  - dark-room exposure meter, **176**
- **Photogravure,** for valve-electrode manufacture, **488**
- **Pickups,** calibration of, variable-speed turntable for use in, **1578, 2701**
  - crystal, for ultrasonic measurements on rods, **1061**
  - design and mounting of arms for, **1577**
  - frequency characteristics, measurement of, **275**
  - gramophone, electromechanical calibrator for, **2412**
- **Piezoelectric crystals,** (See also Quartz)
  - ADP and Rochelle-salt, use at ultrasonic frequencies, **1705**
  - equivalent-circuit constants of, **1975**
  - for filters, **116**
  - I.R.E. standard for, **655**
  - KH_2PO_4 and KD_2PO_4, properties of, **1428**
  - Rochelle salt, domain structure of, **3062**
  - Rochelle type, properties of, **1427**
  - in telecommunications technique, **2525**
  - use of Araldite adhesive in production of, **913**
  - use in receiver circuits, **1502**
- **Piezoelectricity,** of crystals, detection of, **1966**
- **Pitch,** musical, international standard of, **527**
- **Plasma,** gas-discharge, d.c., current fluctuations in, **2670**
  - and the Langmuir layer, **1657**
  - oscillations, theory of, **88, 89**
- **Plastics,** (See also Insulating materials)
  - conductive, Markite, **665**
- **Platinum,** effect of heat treatment on resistance of, (**A**)2540
- **Polishing,** electrolytic, and vacuum technique, **2252**
- **Potential,** of conductor bounded by two intersecting spheres, **880**
- **Power** measurement, with bolometer, for cm waves, **1727**
    - microwave, absolute, **1978,** discrepancies in, **1191**
  - meters, for communication frequencies, **409**
  - supplies, d.c., stabilized, cathode-heater compensation for, **468, 1779** using Mazda-2050 thyratrons, **1532, 2356**
    - for home television receivers, **758**
    - h.v., for e.s. analyser, **469**
    - single-phase parallel inverter, **245**
    - stabilized, 100-A, **467**
    - 5–40-kV, **1257**
- **Prisms,** parallel-plate, verification of theory of, **1344**
- **Projector,** portable, for 16-mm sound film, **545**
- **Protection,** casting-resin technique, **2541**
  - against fungus damage, **664**
- **Proton** microscope, ion optics and mass spectrography, (**A**)1475
- **Public address equipment,** Tesla RU, telecontrol of, **2410**
- **Pulses,** duration sorter and counter, **2734**
  - high-current, production with resonant-cavity accelerator, (**A**)2591
  - nearly periodic, energy spectrum of, **217**

Q

- *Q* measurement, by detuning methods, **143**
    - microwave, taking account of series losses, **400**
- **Quadripoles,** passive, general, synthesis of, (**D**)574
  - with prescribed frequency dependence, **572**
  - resistance, as attenuator elements, **573**
- **Quality control,** sampling, theory of, **2951**
  - and good engineering, (**A**)1559
- **Quantum theory,** asymptotic distribution of eigenvalues, **1183**
- **Quartz,** $\alpha\beta$ transformation point of, **1707**
  - crystals, applications of, **3110**
    - curved, ultrasonic radiation from, **8**
    - elimination of electrical twinning in, **376**
    - for h.f. technology, **114**
    - HT-cut, with zero temperature coefficient, **115**
    - increase of *Q* and reduction of aging for, **375**
    - large, production of, **2795**
    - loading to improve performance of, **2161**
    - oscillations and radiation resistance of, **2115**
    - transmission-line equivalent circuit for, **2162**
  - and fused silica, permittivity of, **3065**
  - plates, very thin, production of, **1178**
  - resonators, as frequency substandards, **1453,** (**D**)2829
  - and use in telecommunications, **1706**

R

- **Radar,** (See also Meteorology; Navigation aids)
  - comparative visibility of positive- and negative-signal c.r. traces, **2386**
  - c.r. tube screens for, **267**
  - echoes from rain, **1685, 1686**
    - the 'bright band', **2221, 2222**
  - fire-control, analysis of noise in, (**A**)1416
  - for hurricane location, **644**
  - in ice-breaker service, **642**
  - marine, effect of rain on echoes, **2511**
    - for merchant navy, **1690**
  - measurements of growth of thunderstorm rain cells, **2220**
  - operating technique, 'pipology', **2219**
  - Persian meaning of the word, **99**
  - pulse time-difference measurements, limit of, **2824**
  - range performance, and statistics of noise, (**A**)1416
  - research at R.R.D.E., Malvern, **100**
  - for storm location, **362, 2778**
  - surveillance, at Antwerp, **1689**
    - at Le Havre, **894**
  - for surveying, **694, 2865**
  - training devices for R.A.F., (**D**)1417
  - volume scanning with conical beams, **1691**
  - weather echoes, **3042,** (**D**)3043
- **Radiation,** (See also Aerials)
  - β-ray, measurement of, (**A**)955
  - from circular current sheets, (**A**)1338
  - dosage-measurement with alkali-halide crystals, (**A**)955
  - e.m., of thermal origin, in ionized media, **2192**
  - ionizing, medical applications of, (**A**)955
  - from magnetic dipole in spherically symmetrical stratified medium, **3009**
  - nuclear, detection of, (**A**)1467
  - radioactive, meter for, **3109**
  - soft, measurement by proportional counters, (**A**)955
- **Radio communication,** h.f., research and development by U.S. Signal Corps, (**A**)1511
  - equipment, in Convair air liner, **1669**
    - in s.s. *Ile de France*, **1000**
  - progress during 1949, **2106**
  - technique, wide-band problems for dm waves, **1613**
- **Radio links,** (See also Communication systems; Radiotelephony; Relay systems)
  - beam, planning of, **3161**
  - Berlin/West-Germany, multichannel, m-λ, **3162**
  - design data for range 60–600 Mc/s, (**A**)1511
  - dm-wave, problems of, **1772**
    - signal/noise ratio in, **3167**
  - f.m., multichannel, noise level in, **1008**
  - f.m. and ph.m., for multichannel telephony, crosstalk in, (**A**)1511
  - microwave, carrier-power requirements for, **2346**
    - multiplex, (**A**)1511
  - multiplex, **1522**
  - planning of, **3160**
  - Port Elizabeth/Uitenhage, using time-sharing modulation, **1005**
  - television, London/Birmingham, **471, 1006, 2025,** parabolic reflectors for, **821**
    - London/Castleton, **3169**
    - microwave, portable equipment for, **3168**
    - 6-kMc/s, New York/Philadelphia, **1523**
  - transalpine, **1007**
  - v.h.f., at Manila airport, **2348**
    - wide-band, **745, 3170**
- **Radioactive isotopes,** criteria for selection for industrial use, (**A**)955
- **Radiosonde,** for potential-gradient measurement, **1294**
  - Swiss, **949**
- **Radiotelegraphy,** German overseas services, **2893**
- **Radiotelephony,** (See also Communication systems; Radio links)
  - in the Alps, **1515**
  - comparison of modulation methods for, (**A**)1511
  - dm-wave, in Germany, **2624**
  - German overseas services, **2893**
  - multichannel, v.h.f., f.m., (**D**)1516
  - multiplex, v.h.f., equipment for, **1004**
  - pulse multiplex, C.N.E.T. equipment for, **997**
  - Thames service for small craft, **999, 2351**
  - for vehicles, at Zürich, **2350**
  - vibrating-reed selective-calling system for, **740**
- **Raindrops,** size distribution of, **2215**
- **Receivers,** (See also Television)
  - a.m./f.m., discriminator for, **446**
    - signal-frequency and oscillator circuits for, **447**
  - broadcasting, French, for 1949–1950, **215**
    - and gramophone pickup connection, **3147**
    - with very high fidelity, **735**
  - for cars, all-wave, Model CR61, test report on, **445**
  - communication, Denco Model DCR19, **1234**
    - design of, **1235**
    - v.h.f., for air traffic, **987**
  - with c.r.o., for waveform of atmospherics, (**A**)1501
  - for dm and cm waves, mixer-stage sensitivity in, **855**
  - f.m., detector circuits for, **2880**
    - limiter discriminator *vs* ratio detector, **225**
    - low-noise front end for, **2618**
    - and multipath reception, **734**
  - f.m. and a.m., signal/thermal-noise ratios for, **1503**
  - frequency-shift, dual-diversity, **1761**
  - front-end design for 400 Mc/s, **216**
  - microwave, low-noise-figure, design considerations for, (**A**)1501
    - noise figure and conversion loss measurement for, **677**
  - mobile, high-selectivity, (**A**)1501
  - negative feedback in, **449**
  - radio and television, mass production of, **214**
  - radio-noise, output-voltage fluctuations in, **1239**
  - reflex, with feedback, **733**
  - sensitivity of, limitation by background noise, **3148**
  - superheterodyne, 'summadyne' principle for, **220**
    - three-point-alignment circuit in, calculation of, **3149**
  - transient phenomena in, **218**
  - u.h.f., with crystal detectors, **3150**
- **Receiving station,** radio, at Acilia, Italy, **1248**
- **Reception,** (See also Field strength; Television; Wave propagation, e.m.)
  - aerial comparator and monitor unit, **1238**
  - diversity, electronic switch for, **304**
    - experimental investigation of, (**A**)1501
    - technique of, (**A**)1501
  - mobile, f.m. broadcast, **2881**
  - mobile, 450-Mc/s, multipath echoes in, **1777**
  - multiple distribution systems for ships, **1237**
  - of pulsed signals in noise, **2883**
    - effect of video filter on, **3151**
  - in random noise, spectrum of f.m. waves, **2885**
- **Recorders,** (See also Sound recorders)
  - digital, Metrotype, **2305**
  - frequency-response, electroacoustic, **1449**
  - ionosphere, single-band, 0–20-Mc/s, **392**
  - isodose, automatic, (**A**)955
  - magnetic, applications of, **2316**
  - magnetic-wire, pulse packing in, **2265**
  - for mean level of atmospherics, **2282**
  - pen, 8-channel, closed-cycle, **2797**
  - photographic, portable, miniature, for c.r.o., **467**
  - range-adjusting, for radiosonde, (**A**)703
  - 24-channel, using c.r. tubes, **2853**
  - 25-channel, for mapping brain-voltage gradients, (**A**)955
- **Recording techniques,** for c.r.o. traces, **759**
  - single-pulse, for radar displays, **1710**
- **Rectification,** theory of, (**A**)240
- **Rectifiers,** (See also Valves, crystal) **118**
  - barrier-layer, characteristics of, **1528**
  - boundary layers in, (**A**)240
  - contact, a.c. impedance of, **349**
  - Cu_2O, easy-flow characteristics of, **755**
  - Ge, G.E.C., **2926**
    - with high inverse voltage, **241**
    - point-contact, metallography of, (**A**)2542
  - Ge-diode, applications in precision measurements, **1717**
    - backward current in, **1305,** and capacitance of, **1306**
    - as mixers for u.h.f. television receivers, **1307**
    - use at h.f., **1791**
  - image force in, **465**
  - mechanical, **2636**
  - Schottky theory and measurements on Cu_2O cells, (**A**)240
  - theory and experiments on, **2798**
  - Se and Cu_2O, characteristics and applications of, **242**
  - Si and Ge, d.c. characteristics of, **2090**
    - theory of, **1941**
  - valve, for high power and voltage, **2927**
    - with thoriated-tungsten filaments, (**A**)243
- **Reflection,** (See also Wave propagation, e.m.)
  - of e.m. waves, at discontinuity of dielectric-constant gradient, **1750** **3135**
    - from rough sea, **1756**
  - formula, Fresnel, verification for long waves, **679**
  - relations between wave fronts and reflector surface, [illegible]
- ——**coefficient,** calculation for potential barrier, **1894**
    - of snow and ice at v.h.f., **900**
    - of water for λ 8.7 mm, **899**
- **Reflectors,** parabolic, for London/Birmingham television link, **821**
- **Refraction,** anisotropy of 3-dimensional array of conducting disks, (**A**)1338
  - application of Huyghens' principle to, **1218**
  - double, ionospheric, **1752**
  - of sound waves, structures for, **5**
- **Regulation,** automatic, **3175**
- **Regulators,** chain-type, transient response of, **1370**
- **Relativity,** general theory of, system of finite mass in, [illegible]
  - special theory of, **82,** and the electron, **343**
- **Relay systems,** (See also Radio links)
  - microwave, **2347**
    - for television, 2-kMc/s and 7-kMc/s, [illegible]
- **Research,** co-operative, at B.S.I.R.A., (**A**)1998
  - and new productions, of Compagnie des Compteurs, **1744**

physics, at T.R.E., Malvern, **3217**
radar, at R.R.D.E., Malvern, **100**
Resistance measurement, absolute, **932**
h.f., by means of lossless quadripoles, **2562**
of metals, effect of transverse magnetic field on, **2480**
thermal and electrical, of tungsten single crystals, **111**
of thin wires, **2189**
Resistors, carbon-layer, **302**
deposited-film, **301**
fixed, for communication equipment, **(D)300**
frequency variation of, **2435**
h.f. properties of, **(A)1355**
with negative temperature coefficient, **308**
nonlinear, colloidal, **2247**
power, wide-band, **2732**
Resonance indicator, sensitive, **2885**
Resonators, acoustic, of circular cross-section, **2688**
cavity, bolometer, wide-band, for λ 10 cm, **167**
concentric-sphere, **1104**, frequency variation for small displacement of inner sphere, **1105**
elimination of low frequencies in, **1377**
German work on, **319**
interaction with spiral electron beam, **1626**
measurement of *Q* and natural frequency of, **931**
mode coupling by slots in wall of, **2746**
reflex, analogue analysis of losses in, **584**
resonance-resistance measurement for, **321**
spherical, forced oscillations in, **2448**
theory of, **320**
tunable, for reflex klystrons, **2449**
crystal, (See also Piezoelectric crystals)
frequency checking of, **2566**
λ/4 coaxial-line, for betatron-started synchrotrons, **430**
Ripple tank, for aerial phase-front measurements, **1979**, **2841**
Rutherford, life and work of, **2102**

S

Screening, in communication equipment, **2984**
e.m., application of generalized-impedance method, **3033**
Sealing, hermetic, of capacitors, **1180**
of glass and mica, **1437**
of transformers, **1179**
Seals, glass/metal, cylindrical, stresses in, **2806**
physics of, **2253**
metal/ceramic, for high-temperature applications, **(A)1554**
Selectors, vibrating-reed, for mobile radio systems, **756**
Selenium, amorphous, photoconductivity of, **2519**
electron-bombardment conductivity of, **2520**
Semiconductors, **118**, **(A)119**
chalk, deep-quarried, properties of, **2949**
colloidal suspensions, **2247**
conduction electrons in, **2475**
conduction mechanism in, **666**, **909**
constants of, u.h.f. measurement of, **3087**
electrical conductivity of, theory of, **910**
electrical properties of, **(A)2544**
excess, transient phenomena in, theory of, **378**
external photoelectric effects in, **(A)668**
ferrites, resistance of, **2240**
Ge, energy gap in, **3025**
high-resistance barriers at crystal boundaries in, **(A)1940**
hole injection in, **380**
internal photoeffects in, **(A)668**
n-type, impedance of grain boundaries in, **(A)1939**
neutron-irradiated, effects in, **2196**, thermal equilibrium in, **3024**
photoelectric effects in, **1924**
surface conductance of, **1818**
transmutation-produced, **2195**
impurity, Hall-effect formulae for, **2491**
London University research on, **2216**
PbS, crystal diode and triode action in, **2088**
photoconductivity and photoemission of, **(A)668**
photoeffects in, **(A)668**
physics of, **377**
p-n junctions in, **379**
potential fluctuations in, **(A)2476**
Si, effect of nucleon bombardment on resistivity of, **(A)1938**
transition from insulation to conduction in, **(A)2545**
soldered contacts on, **3069**
spontaneous current fluctuations in, **667**
theory and applications of, **3070**
theory of noise in, **(A)2477**
theory and properties of, **2248**
Servicing, of airborne equipment, **693**
Servomechanisms, a.c. e.m. resolvers, **(A)1526**
application in analogue computers, **919**, **1714**
applications to airborne radio equipment, **1254**
d.c./a.c. converter for, **754**
design equations for, **236**
electronic simulator of, **(A)2267**
error coefficients of, **2902**
and feedback amplifiers, theory of, **2175**
industrial, **(A)1998**
magnetic-fluid clutch for, **237**
maximum accuracy of, **2634**
modern methods of synthesis, **(A)1355**
and modern physics, **235**
nonlinear, theory of, **2030**
relay, analysis of, **(A)1252**
sampling, analysis of, **2029**
selsyn, ph.m., **1258**
stability of, **1778**
and telecontrol, **1253**
theory of, **1251**
Signal generators, **410**
for Citizens' band, **164**
G.R. Type 1001-A, **946**
for testing v.h.f. omnidirectional-range equipment, **2292**
15 c/s–16 kc/s, **692**
Signal/noise ratio, in u.h.f. receivers, **2882**
Signals, analytical, with limited spectra, **1020**
Similitude, principle of, and application to measurements on aerials, **1126**
Skin effect, analogy with magnetism, **86**
anomalous, for strong h.f. field, **872**
Solar activity, and geomagnetic storms, 1949, **1910**
——**corona**, **1403**
——**flares**, emission of radiation from, **357**
1948, ionospheric effects of, **619**
19th Nov. 1949, **2206**, and cosmic rays, **3039**, and radio observations, **1911**
——**radiation**, r.f., **(A)356**, **614**, **1909**
absorption in corona, **1398**
during eclipse, May 1947, **1135**, **1906**
and fading of radio signals, **1228**
m-λ, bursts of, **884**, characteristics of, **885**
thermal, **883**
and transients in ionized medium, **1678**
from undisturbed sun at λ 60 cm, **1401**
at 200, 600 and 1200 Mc/s, **616**
Sound (See also Absorption; Acoustics)
analysis using c.r. tube, **9**
attenuation, for transverse waves in slotted rectangular waveguide, **1057**
diffraction by rigid disks and square plates, **(C)1058**
theory of, **1052**
edge tones, production by gas jets, **2112**
field, of freely vibrating circular disk, **1821**
near piston membrane, **1051**
of point source in multilayer medium, **1216**
of pulse in semi-infinite duct, **3088**
of spherical radiator, energy flux in, **1830**
of vibrating circular plate, **525**
propagation, in narrow conduits, **2**
in open-ended channel, **1560**
viscous losses in large waveguides, **2687**
radiation, from open tubes, **4**
and propagation, **797**
transient, **1839**
radiation pressure of spherical waves, **2401**
radiators, concave, theory of, **3**
receivers, harmonic distortion in, **799**
reflection, non-specular, **(A)1841**
phase distortion of pulses at interface of two media, **1840**
refraction, structures for, **5**
scattering, from fluid sphere, **2686**
tone source for standard pitch, **526**
transmission, through double walls, **1845**
through metal plate, **522**
transmitter, underwater, **2119**, for 24-kc/s signals, **1055**
velocity in H_2O and D_2O at 0°–100 °C, **796**
vibrations, in tubes, visualization of, **2955**
waves, plane, pressure and velocity in, **2396**, production of, **798**
——**recorders**, disk, study by dynamic analogy, **1856**
magnetic, **21**
sonograph, elements and principles of, **271**, **1830**
——**recording**, choice of system for, **539**
disk, for broadcasting, **541**, **1569**
measurement of stylus velocity amplitude, **20**
modern practice in, **540**
recent trends in, **2970**
standards for, **1334**
disk and magnetic, B.B.C. mobile equipment, **273**
elimination of noise in, **1570**
film, noise reduction by use of delay networks, **1855**
magnetic, **22**
adjustments for optimum performance, **1571**
frequency-response measurements, **(A)1319**
improved techniques for, **23**
for motion pictures, **1572**
overall frequency characteristic in, **2121**
use in the S.A.B.C., **1854**
magnetic-tape, record-duplication method, **2803**, **2804**
measurement of turntable speed fluctuations, **272**
for speech and music, flutter in, **(A)1319**
stereophonic, **13**
tone control in, **1853**
——**reproduction**, choice of system for, **539**
disk, groove and stylus wear in, **2413**
needle-scratch suppressor for, **1117**, **1389**
pickup design for, **546**
study by dynamic analogy, **1856**
from disks and records, for broadcasting, **274**
listeners' tonal-range preferences, **802**, **2118**
magnetic, effect of tape and ring-head characteristics on, **804**
linearization of output from reproducing head, **1832**
portable projector for 16-mm film, **545**
stereophonic, **13**
Space, vectorial, **132**
Space charge, (See also Valves)
electron-optical properties of, **3118**
Spectrography, a.f., physiological applications of, **(A)955**
Spectrometers, a.f., stroboscopic, **2400**
β-ray, magnetic-lens type, **1466**
X-ray, G-M-counter, dead time and nonlinearity of, **181**
for λ 10-cm, with mechanical sweep, **2839**
Spectroscopy, microwave, square-wave modulation in, **1905**
at wavelengths of 2–3 mm, **1668**
Speech intelligibility, under conditions of deafness or loud noise, **(D)270**
effect of interruptions and noise, **1843**
and relation to telephony, **1844**, **(C)2403**
and room acoustics, **2960**
theory of masking by reverberation, **532**
sounds, frequency analysis and compression of, **2693**
portrayal of pitch of, **12**
reproduction of, **1329**
and their statistical properties, **(A)1319**
Stability criteria, **2986**
use of Hurwitz determinants, **2433**
criterion, Nyquist's, **894**, for feedback networks, **1870**, generalization of, **293**, **(D)294**, validity of, **1593**
Thévenin's theorem, simple proof of, **306**
testing, by means of circle diagrams, **825**, **2987**
Stabilization, (See also Frequency stabilization)
automatic, of amplifier gain, **3010**
of field of large electromagnet, **1531**
of f.m. oscillator by crystal discriminator, **(A)1550**
frequency, by means of spectral lines, **2140**
gain, of i.f. amplifiers by inverse feedback, **2461**
of simultaneous-equation solvers, **(D)1956**
voltage, of battery-charging equipment, **2903**
using current-stabilized supply, **244**
zero and gain, for wide-band d.c. amplifiers, **2458**
Stabilizers, current, electronic, **1529**
voltage, with parallel regulating valves, **1530**
photocell input impedance for, **1013**
200-kV, **3176**
Standard frequency, (See also Frequency)
transmissions from Rugby, **1192**
Standards, (See also individual subjects)
field-strength, v.h.f., **3090**
Statistics, application of, to acceptance specifications, **(A)1559**
to engineering tolerances, **(A)1559**
for planning and analysis of experiments, **(A)1559**
in research and development, **(A)1559**
Steel, stainless, magnetic properties of, **2527**
Storm location, (See also Radar)
by radar, **362**, **644**
Stratosphere, ionization of, **626**
Sun, general magnetic field of, **1677**
tentative model of, **1134**
Sunspot cycle, theory of, **2208**
Sunspots, Hall currents and ejection of prominences, **617**
mathematical characteristics of variations of, **1137**
origin of, new theory of, **2207**
probable variations during next cycle, **92**
provisional numbers, April–June 1949, **618**, July–Sept. 1949, **1138**, Jan.–March 1950, **2495**
and radio fade-out statistics for 1948, **3146**
relative numbers, final, for 1949, **2494**
20th Feb. 1950, and ionospheric storm, **1500**
Superconductor, CbN, as r.f. detector, **223**
Switches, electronic, application to c.r.o., **1602**
automatically synchronized, **1603**
for diversity reception, **804**
speed of, **1853**
t.r., **1029**
Synchronization, of oscillator and pilot by phase control, **1660**
of quasi-sinusoidal oscillators, **1349**
television, generator for, **760**

T

Tachometer, electrical, **184**
Telecommunication theory, Heaviside's contributions to, **(A)2348**
Telecontrol, by a.f. discrimination, **1215**
Landis and Gyr a.f. system, **2866**
of pile reaction, **3128**
requirements of centralized systems, **1744**
Sauter system, **1744**
self-synchronous units for, **2358**
of Tesla public-address equipment, **2410**
Telegraphy, cable, station equipment at Acilia, Italy, **1942**
Telemetry, electrical, **183**
matrix system for, **(A)1467**, **2350**
Metrotype system, with digital recording, **2865**
of phase-shift, errors in, **(A)1966**
radio, high-accuracy, **1723**
self-synchronous units for, **2358**
technique of, **2304**
Telephony, analysis-synthesis, and the vocoder, **(D)457**
circuits, C.C.I.F. reference standard for articulation tests, **1848**
coaxial-cable system for, **739**, **1244**
multiplex systems for, **1522**
research in South Africa, **2341**
speech inverter system for, **2021**
transmission aspects of telephone instrument, **2342**
voice switched intercommunication equipment, **2890**
Television, (See also Aerials; Interference) **761**, **2637**
amplifiers, i.f., use of pentode RCA-6CB6 in, **(A)1534**
video, frequency response adjustment in, **2296**, stagger-tuned, **255**, wide-band, phase-error compensation in, **2752**
5-kW video and 2·5-kW sound, **(A)1534**
arrangements for 1950 Oxford and Cambridge boat race, **2906**
artificial delay lines for, **1269**
B.B.C. film-dubbing suite for, **2910**
brightness and contrast in, **3182**
cameras, developments since 1930, **1780**
image isocon, **247**
image orthicon, manufacture of, **2041**, R.C.A. Type 5820, **1260**, **2861**, **2914**
Marconi mobile equipment, **2042**
scanning tube for film, **1261**
Vidicon photoconductive pickup tube, **(A)1534**, **2040**
channel allocations for reducing interference, **258**
coaxial-cable transmission system for, **739**
colour, dot systems for, **1264**
dot-interlacing, R.C.A. system, **248**, synchronization in, **2039**
dot-sequential system, receivers for, **2648**, sampling principles of, **2640**
electro-optical filters for, **(A)1534**
with faithful reproduction, **3186**
flicker and colour-fringing in, **3192**
de Forest system, **762**
R.C.A. kinescope for, **2363**
R.C.A. projection receiver for, **2045**
in U.S.A., comparison of different systems, **763**, **1535**
6-Mc/s bandwidth high-definition system, **1263**
c.r. tubes, deflection and h.v. systems for, **1783**
deflector coil characteristics for, **2043**, **2362**
design and manufacture of, **2943**
European and American, **1781**
manufacture of, **2385**
metallized, manufacture of, **1262**
permanent-magnet focusing for, **1787**
projection, double-layer screen for, **2047**
in Czechoslovakia, **251**
developments by Fernseh G.m.b.H., 1939–1945, **2909**
development in Germany, **2908**, in wartime, **472**
diplexers for feeding aerials, **(A)1355**, **2651**
equipment, for industry, **(A)1467**, **2359**, **2645**
frame timebase, **2455**
gain control by black-level monitoring, **2358**
image reproduction by v.m. methods, **(A)1534**
K-factor and picture definition in, **2639**
line standard, choice of, **2642**
and receiver economics, **766**
modulator circuit, **1259**
monitors for transmissions, **2037**, **2290**
new equipment at Alexandra Palace, **1539**
optimum number of channels for, **1265**
portable microwave radio-link equipment for, **3168**
positive-modulation, a.v.c. system for, **1789**
power supplies, for home receivers, **758**
progress in Great Britain, **3181**
projection, large-screen, **3187**, eidophor method for, **2641**, French equipment for, **764**, for theatres, **249**
receiver, using MW6-2 c.r. tube, **2643**
quality rating of images, **(A)1534**
random noise, perception of, **1276**
receivers, coil design for, **567**
fixed-tuned wide-band booster for, **1272**
high-definition, technique of, **1018**, **(C)1788**
with interchangeable units, **253**
measurement of transient response of, **1194**
Murphy Type-V150, **1790**
noise discrimination circuit for, **(A)1534**
practical design and quality control of, **(A)1534**
quality control of, **2100**
signal distortion in, **1545**
simplification of, **1271**
for sound, **767**
'spiral' inductuners for, **2918**
tuners, (See also Tuners) printed-circuit, design of, **(A)1534**, wide-band, **2046**, for 54–216 Mc/s, **1762**
TV5 de luxe, design details of, **3190**
u.h.f. converters for, **2036**
use of Ge diodes in, **1543**
video-frequency stage, **768**, **1782**
reception, field-strength contours for vision signals from Sutton Coldfield transmitter, **2652**
in fringe area, **1544**
below line of sight, **257**
reduction of fading and interference in, **2052**
selectivity in, **1542**
at 95-miles range, **3193**
relay systems, (See Radio links)
in relief and in colour, **2638**
sound system, intercarrier, using Type-6BN6 valve, **1784**
spot-wobble in, **1541**, **2044**
standards, **1538**
C.C.I.R. recommendations on, **3185**
I.R.E. Standard 23.S1 on measurement methods, **2085**
station, at Sutton Coldfield, **1019**
u.h.f., KC2XAK, Bridgeport, **(A)1534**, **1795**, **2086**
WBAL-TV, Baltimore, **256**
WHIO-TV, Dayton, **1796**
WTCN, Minneapolis, **1773**
stereoscopic, **1266**
synchronization, correction of interference effects on, **3180**
method for long ranges, **1786**
synchronizing-signal generator, **760**, **2038**
synchronizing-signal separator, design of, **2649**
terminal equipment for coaxial lines, **1267**
test-pattern generator, **2842**
transmission, s.s.b. and d.s.b., analysis of, **2911**
transmitters, design considerations for, **(A)1534**
low-power, **1270**
lower-sideband measurements for, **3065**
mid-level modulation for, **765**
Russian, **2647**
sound-channel, Eiffel-Tower, **1540**
u.h.f., 1-kW, Type TTU-1A, **(A)1534**, **2659**
wide-band r.f. problems in, **(A)1534**
u.h.f., field-strength measurements in Pittsburgh, **2015**
field tests at Bridgeport, U.S.A., **1797**, **2049**
1029-line, **2016**
Temperature control, thermistor unit for, **2031**
high, noise thermometer for, **947**
low, measurement by thermal noise, **3106**
Test equipment, calibrated c.r.o. curve tracer, **1460**
for calibration of a.c. and d.c. instruments, **686**
for coaxial cables, **2572**
for coaxial-cable telephony circuits, **890**
for noise and distortion in v.h.f. links, **2575**
pulse, for display of valve characteristics, **2576**
pulse generator electronic switch, for visual testing of wide-band networks, **2580**
radar, for 9–9.7 kMc/s, **404**
for u.h.f. television band, **(A)1464**
v.h.f., British, **2568**
——**methods**, for receivers, critical study of, **3104**
standard, I.R.E., for mobile communication equipment, **678**
Thermistors, application in control networks, **1350**, **2586**

dynamic characteristics of, 2143
electrolytic, 48
properties and applicatons of, 49
static characteristics of, 2142
Thermocouples, refractory, and emissivity determinations, (A)1925
Thermostat, control unit for, 2031
using thermistors, 2586
Thoria, electrical resistance of, 2539
sintered, activation and conductivity of, (A)1934
Thunderclouds, charge on water droplets in, 2507
Thunderstorms, rain cells, radar measurements of growth of, 2220
Time measurement, chronographs, crystal control of motors for, 1185, millisecond, 923
with direct-reading clock, 391
e.s., down to 0.5 ms, 921
standards, adjustment of, 1447
Timebases, frame, television, 2455
linear, positive- and negative-sweep, 2453
self-adjusting, 1112
slow-sweep, 589
television line, use of diode Type EA40 in, 782
Timing control, remote, by carrier frequency on power lines, 2300
Titanium, emissivity and resistivity of, 1177
Transducers, electroacoustic, applications of negative feedback to, 1068
calibration using plane-wave reciprocity parameter, 531
constants of, 2965
impedances and equivalent circuits of, 2966
linear, passive, theory of, 537
magnetostrictive, low-Q, directional, (C)536
using Rochelle-salt crystals, 2969
electromechanical, reciprocity calibration of, 14
Transductors, (See also Amplifiers, magnetic)
no-load characteristics of, 299
operation and applications of, 1596
series, self-excited, transient regime of, 564
Transformers, a.f., square-wave testing of, 1964
for 0.2 c/s–20 kc/s, 2728
coupling, bifilar, 2138
differential, and applications, 695
double-tuned, design of, 562
hermetic sealing of, 1179
h.f., 1875
i.f., design of, 1595
impedance, wide-band, for coaxial line and helix, 1612
output, abacs for design of, 826
performance characteristics of, (A)1355
pulse, 2988
exponential-line, (A)1355
small, current density and permissible heating in, 1871
50-c/s, no-load loss measurement for, 1967
sweep, with ceramic iron core, 2916
use of U/I cores in, 2989
wide-band, series-parallel tuned, design of, 2445
winding capacitance of, 296
Transient response, of television receivers, 1194
Transients, electrical, display equipment for, 1205
in filters, calculation of, 2154
integral approximation method, applications of, (A)1355
in ionized media, and solar noise, 1678
Laplace transformation for study of, 914
measurement of, (A)1998
in radio receivers, 218
Transistors, Ge, characteristics of, 1310, and circuits for, 1312
equivalent circuits for, (A)1026
filamentary, 380
h.f. operation of, 2459
magnetically biased, 2089
p-n junction, 379
possible power applications of, (A)1026
response to square pulses, 1817
theory of, (A)1026
and transistron, comparison of, 3210
Type A, circuit aspects of, 334, l.f. noise in, 2938, physical explanation of characteristics of, 1311
use in counting circuits, 1092
PbS, voltage gain and frequency response of, 2672
Transistron, and transistor, comparison of, 3210
triode Type PTT601, 789
Transmission efficiency, and bandwidth, 454
f.m., bandwidth calculation for, 1023
——**lines,** attenuation of e.m. waves in, 2972
bifilar, theory of, 2126
coaxial, bead design for, (A)277
tapered termination for, 2421
delay, calculation of, 2130
helical, propagation in, 1859
video, 1269
determination of s.w.r. for, 1719
effects of bends in, 2418
exponential, compensation arrangements for, 1583
as transformers, 836
heterogeneous, propagation in, 549
h.f., energy relations for, 29
vector diagram for, 33
open-wire, and aerials, 281, 399
current and charge distributions on, (A)1338
for f.m. aerial feeder, 291
image-line measurements for, 810
overhead, radiation from, 2349
phase distortion in, 2125
r.f., abacs for, 808
shielded-pair, with unbalanced termination, 2417
slotted, v.h.f., correction factors for, 2836
surface-wave, (A)1338
terminal impedance and generalized 2-wire-line theory of, 28
thin-wire, in stratified medium, propagation along, 1858
twin, capacitance of, 2416
and waveguides, resonant, impedance of, 1074

Transmitter-receivers, mobile, single-channel, 2894
Transmitters, (See also Television)
amateur, band-switch, 1283
75-W variable-frequency driver unit for, 475
for λ 160 m, free from television interference, 476
14-Mc/s, television-interference suppression in, 2661
broadcasting, a.m., Australian, design of, 775
150-kW, Voice-of-America, Munich, 1776
150-kW, 540–1600-kc/s, 2658
Beromünster, 100–200-kW, 1524
f.m., u.s.w., 10-kW, 2922
high-efficiency, 2369
710-kc/s, KTBS, at Shreveport, 477
for Citizens' band, 774
crystal-controlled, 2924
communication, h.f. and m.f., aircraft, 1282
f.m., 3-kW, for state police, 2923
m.f., 3-kW, design of, 1284
radiotelegraph, l.f., for arctic use, 2368
s.s.b., S.F.R. 2-kW and 20-kW, 777
spark, for damped cm waves, 1021
television-sound, Eiffel-Tower, 1540
temperature compensation of, 1549
u.h.f., use of power valves in parallel in, 474
unattended, a.f.c. for, 1280
10-kW, 2.5–23-Mc/s, S.F.R., 776
50-kW, 4–26-Mc/s, Types AN/FRT-5 and 6, 1551

'Tron' glossary, 2107
Tropicalization, of electrical equipment, 3066
of materials for valve manufacture, 1432, 2244
Troposphere, (See also Atmosphere)
and ionosphere, cellular atmospheric waves in, 1680
modified refractive index deduced from radio data, 2773

Tuners, television, u.h.f., 1792
wide-band, 2046
for television and f.m., 2884
54–216 Mc/s, 1762
Tuning, of output stage, application of bilinear transformations to, 80

U

Ultrasonic absorption. See Absorption.
applications, adhesion measurement, 175
elastic-constant measurement, 2844
flaw detection, 2845, in gas-turbine disks, 1989
locator for medical applications, 1196
obstacle detection in air, 415
operation of lantern-slide changer, 2846
polymerization of emulsions, 2583
soldering iron for light alloys, 970
in therapy, 2301, apparatus for, 2398
oscillations, generation and effects of, 1322, 1323
generation by electrostriction, 2957
Ultrasonics, energy focusing in, 1561, 2685
in fluids, 6
propagation velocity in liquid mixtures, 1562
pulse instruments, (A)1467
survey, 269
underwater scattering by liquid cylinder, 529
Units, and definitions of e.m. quantities, 1653
Giorgi system, adoption of, 2193
introduction of, 1125, (C)2467
rationalized, 867

V

Vacuum gauges, ionization, reading to 10^{-10} mm Hg, 2785
McLeod, alloy-filled, 366, rotary, 2784
Philips, for pressure range 10^{-1}–10^{-7} mm Hg, 1423, 2518
using Pirani cooling of tungsten filament, 1922
plant, design of, 898
pumps, Hg diffusion, improved, 652
rotary, pumping rate of, 3054
systems, design of, 898
technique, development of, 898
gas emission in l.v. incandescent lamps, 2226
measurement and control of leakage, 898
measurement of pressures <10 mm Hg, 898
measurement of pumping speeds, 898
surface phenomena useful in, 898
Valves, (See also Counter tubes; Transistor; Transistron)
accelerated life-testing of, (A)1454
aligned-grid, computation of electrode systems for, 2095
current-density distribution in, 1821
amplifying, cm-wave, recent developments in, 2666
with negative feedback, as controllable resistors, 2992
beam, gated, Type 6BN6, 1292, 2931, 2932, applications in television, 1785, as limiter-discriminator, 1803
beam-deflection, e.s., M.I.T., for digit storage, (A)1554
for f.m. detection, 224
with ribbon beams, 1801
using space-charge for deflection, (A)1554
cathode-current variation with heating power, 1805
characteristics, display on c.r.o., 2288
pulse equipment for display of, 2576
cold-cathode, glow tubes, circuits for, 489
relay, use with high-resistance grid/cathode circuits, 1354
contaminant in, investigation of, (A)1436, (A)2057
crystal, high-impedance, 'fieldistor', 3198
tetrode, as frequency converters, 2332
definitions of terms, I.R.E. Standard, 1804
dekatron, for counters, 2066
diode, cathode field in, 780
cylindrical, h.f. response of, (A)496, 2937, retarding-field current in, 2092
Ge, glass-sealed, (A)1554, high-temperature characteristics of, (A)1554
as mixers at u.h.f., 1505
noise, cylindrical, transit-time correction factor for, 499, temperature-limited, design of, 500
planar, current growth in, 1816, extension of Llewellyn's transit-time solution, 497, space charge in, 2383
space charge in, 781
total-emission conductance measurements at λ 35 cm and 15 cm, 517, 2086
total-emission damping in, 2087
Type EA40, use in television line timebases, 782
double-beam, amplification in, 511
theory of, 874
double-cathode, spontaneous fluctuations in, (D)791, (D)1035, (C)1831
electrode manufacture by photogravure, 488
electron-coupler, for u.h.f. a.m., 1822
European and American, for television equipment, 1781
for frequencies >1000 Mc/s, 1295
gas-filled, industrial applications of, 963
measurement of voltage drop across, 2291
hum with a.c. heating, 1036
interelectrode capacitance of, (D)1313
klystron, high-power, recent developments in, (A)1554
pulsed, high-power, 10-cm, (A)1554
reflex, beam-loading in, 787, efficiency of, 2948, modulation of, 2370, space-charge effects in, (A)1554
theory of, 1830
2-cavity, 1558—
life expectancy of, statistics of, (A)1559, 2104
magnetron, electron-optical mapping of space-charge field in, 2315
influence of cathode emission properties, (A)2098
interdigital, modes in, 509
inverted, with external cathode, (A)1554
multicavity, resonance frequency of, 3214, space-charge resonance frequencies of, 2946
new types, measurements on, 507
operation near critical anode voltage, 1557
oscillation modes for, 508
planar, phase focusing in, 1827, under static space-charge conditions, 1828
resonance frequencies of space charge in, 2678, measurement of, [illegible]
split-anode, new type, 1829
toroidal, design of, 2097
turbator, 2945, as microwave oscillator, 3005
whole-anode, standing current in, 1826
microwave, electronic fundamentals of, 1824
miniature, French, manufacture of, 1802
mixer, contour analysis of, 1293
multigrid, as electrometers, 150
modern, physical principles of, 483, survey of, 482
mutual-conductance change with frequency, 1301, (D)1812, (D)2379
with mutually bombarding oxide cathodes, 3209
negative-resistance characteristics of, 2137
new, various, 1289
oscillator, u.h.f., wide-range, 2677
with oxide cathodes, vacuum factor of, 1813
ϕ-detector, for f.m., 505
planar, admittances at 4000 Mc/s, 1309
potential-function calculation for, 487
power, with low distortion, 484
pulse-distribution, high-power, (A)1554
reactance, for f.m., 1024
receiving, miniature, 1030
r.f. performance in television circuits, 262
using secondary-electron emission, 1814
sensitivity of, 986
rugged, shock-proof, (A)1554
for use below 30 Mc/s, 1291
residual gas in, tests for, 486
with ribbon-shaped electron beams, 3213
secondary-emission, 2381
use in wide-band amplifiers, 336
shot effect, and limits of amplification, 518
suppression in triodes and pentodes, 516
theory of, 515
transit-time deterioration of space-charge reduction of, 792
slipping-stream, wave propagation in, 2375
subminiature, with 15-mA filaments, 1290
switching, for digital-computer applications, (A)1554
test equipment, universal, visual, 411
test methods, I.R.E. Standard 50IRE7.S2 on, 3103
thyratron, d.c. bias control of anode current in, 503
grid-potential variations and recovery time of, 2676
grid resistance and recovery time of, 2675
hot-cathode, 504
hydrogen-filled, 502
pulse-controlled, 784
trigger-grid, and grid emission, (A)1554
transients in, calculations of, 1806
transit-angle functions and Fourier transforms, (D)1832
transit-time, theory of, 1825
transmitting, a.c.-heated, hum reduction in, 2936
for dm and cm waves, 3202
grid emission in, 2935
high-power, radiator system for, 2933
surge testing of, 169
u.h.f., high-power, parallel operation of, 474, physics and technics of, 1807
for use up to 30 Mc/s, 2058
travelling-wave, 1294, (C)1808, 2060, 3204
beam focusing in, 2376
efficiency of, 3205
helix resonance in, 2944
interaction phenomena in, 2061
low-level operation of, 3206
low-noise, 2059
magnetron-type, 2064
measurements on, 2062
recent developments in, 1298
theory of, 1809; 1810, 2377, 3203; 1811, for large amplitudes, 1296
transverse-current, performance and analysis of, (A)1554
Type T.P.O. 85, 1297
1-kW, 2378
triode, beam, 500-kW, R.C.A. Type 5831, (A)1554, 2093
gas-filled, ignition and discharge processes in, 3212
disk-seal, 30-W, Type T30H, 783
planar, microphony in, 2094, microwave, transadmittance of, 1315, microwave, Type 416A, 3211
receiving, for dm λ, 1314
u.h.f., pencil-type, 501
v.h.f., shot effect in, space-charge smoothing of, 2674
tropicalization of materials for manufacture of, 1432, 2244
u.h.f., technology of, 2096
transit-time effects in, (D)1299
variable-capacitance, Type SR1041A, for frequency control, (A)1554, 2939
v.h.f., survey of developments, 2671
v.m., electron bunching in, 510
radial-beam, microwave, 2947
theory of, 1034, 3215
voltage-regulator, glow-discharge, 1014
for 30–3000 Mc/s, 3201
Varistors, Ge, response to square pulses, 1817
Vibration, of metal plate in sound field, 522
meters, with electrical indication, 185
Voltage, direct, low, measurement of, 1451, 3089
0–0.5 mV, amplifier instrument for measurement of, 1450
multipliers, metal-rectifier, for h.v. supplies, 1256
Voltmeters, for a.c., expanded-scale, (A)687
with large frequency and voltage ranges, 1969
peak, time-constant measurement for, 153
single-pulse, 939
valve, direct-voltage, feedback, 1971
survey of, 1970
for 1 mV, 10 mV. . .1kV and frequencies 1 kc/s–30 Mc/s, 2285
Volume control, automatic, as feedback problem, (C)3014
expansion, using moving coil loudspeaker, 2122

W

Wattmeters, dynamometer, for a.f., 1726
Wave propagation, acoustic, in narrow conduits, 2
field of point radiator in nonuniform layered medium, 1394
Wave propagation, e.m., (See also Field strength; Reception; Television; Waveguides; Waves)
abnormal 50-Mc/s ranges and sporadic-E layer, 1222
absorption in parabolic ionospheric layer for oblique incidence, 1154
angular separation of direct and reflected 3.2-cm waves, 2016
back-scatter observations by the C.R.P.L., 2325
boundary conditions for two absorbent media in contact, 436
C.C.I.R. night-field curves, approximate formula for, 1758
cm-λ, 2616
Fresnel's laws for, 1663
coupling of ordinary and extraordinary rays in ionosphere, 978
in curved ionosphere, (A)1482, 2013
of decametre waves, Doppler effect in, 1227
for WWV and WWVH standard-frequency transmissions, 1232
of decimetre waves, 3140
and deduction of critical frequencies, 1753
diffraction, effects over 47-mile desert path, 203
in the ionosphere, (A)719
over the earth, 438
equation for, solution by conformal transformation, 1480
fade-out observations, (A)1498
fade-out statistics and sunspots for 1948, 3146
fading, analysis of observations at spaced receivers, 1233
of dm waves, due to meteorological conditions, 983
of m.f. and h.f. waves, 443
of single downcoming wave, 442
field strength, as function of range, 1229
variations at v.h.f. and u.h.f., 1496
WDTV survey, 250
German measurements on, 441
through ground, 981
ground interference pattern for 16-kc/s signals, 1491
gyrointeraction, 2328, 2617
h.f., variations in direction of arrival, (A)1497
Huyghens' principle, application to refraction, 1218
for imperfectly transparent medium, 523, 712, 1749
identification of oblique-incidence paths, 2873
in ionized medium, 976
ionosphere, 439
cross-modulation in, 211, (D)2327, for oblique incidence, 1230
effect of D-layer on very-low-frequency waves, (A)723, 1223
geometrical optics of, 3142
higher-order approximations in, 2606
ray paths in, 718, 2875
over land/sea path, (D)732, 2872
of long and very long waves, (A)724
long-scatter echo patterns, (A)721
Lorentz polarization term and vertical-incidence absorption, (A)698
low-level atmospheric ducts, 2329
measurement of small angles of elevation for metre waves, 3130
for medium waves over inhomogeneous terrain, 2011
microwave, (A)1482
drift of fluctuations on overwater path, 2876
effect of water vapour for temperatures below 0°C, 2612
estimation of attenuation from meteorological statistics, 2879
signal strength, phase, and index of refraction in, 1483
M-mode, 1230
Mögel-Dellinger effect, origin of, 3145
at λ 1250 m, 716
m.u.f. forecasting, (A)1485, 1754
oblique incidence, and magneto-ionic theory, 714
and WKB approximation, 205
work of C.R.P.L., (A)720
through parallel-plate media, 1344
through plasma layers of finite thickness, 3134

polarization of 150-kc/s waves reflected from ionosphere, **3137**
prediction of 2-m-band transmission conditions, **212**
problems in, simulation of, **2014**
pulse transmission over long distances, **(A)722**
reflection, at discontinuity of permittivity gradient, **1750**, **3135**
    effect of ionospheric disturbance on long waves, **2326**
    from ionosphere layer, **207**, and ground-wave scattering, **1221**, of long waves, **(A)1486**, **(A)1489**, **(A)1495**, **2326**
    from multilayer media, **1217**
reflection coefficient of linearly graded layer, **715**
refractive-index profile of stratified atmosphere, **1494**
round-the-world 18-kc/s signals, **1231**
scattering from E region, **(A)1488**
s.w., anomalous, **3133**
    round the earth, **3139**
    fade-out during total eclipse of sun, **730**
    over great distances, **3138**
    London/Madrid, probable law for, **2614**
    morning fading of signals, **440**
    optimum working frequencies for ranges up to 2500 km, **2615**
    periodic fading in, **3143**
    reception at Madrid of various overseas transmissions, **2323**
    Washington and Madrid forecasts for, **2324**
    2.5–35 Mc/s, Washington/Madrid, **2613**
    10-Mc/s, over ranges of 500–1300 km, **2877**
    12-Mc/s and 15-Mc/s, over ranges of 500–2400 km, **2878**
Sommerfeld's and edge-diffraction theories of, **1226**
in stratified medium, **977**, **3131**
    application of normal-wave method, **975**
surface waves, Sommerfeld's, **713**, existence of, **2871**
tropospheric, effects for medium and short waves, **213**
    scattering, theory of, **1757**
u.h.f., in the Alps, **3163**
u.s.w., **982**
v.h.f. and u.h.f., within optical range, **729**
v.l.f., **(A)1493**
through wire grids, **204**
at 25 Mc/s–24 kMc/s, over desert terrain, **1492**
for 3.2-cm waves over 27-mile desert path, **731**
Waveform analyser, using simple tuned circuit, **2573**
    and synthesiser, **158**
analysis, a.f. methods and apparatus for, **2690**
    graphical, for pulses, **681**
Waveguides, applications of metallic quasi-dielectrics, **(A)1338**
circular, excitation by ring aerial, **1075**
    nonuniform, field in, **548**
    containing two coaxial media, propagation in, **2707**
corrugated, single-surface, **(A)1338**
coupled, spatial beating in, **30**
beyond cut-off frequency, application to piston attenuators, **818**, **(C)1582**
dielectric-filled, propagation in, **2419**
dielectric-rod, **1079**
    attenuation in, **1080**
discontinuities in, theory of, **1077**
field of arbitrary current distribution in, **2127**
field patterns for evanescent modes, **1076**
impedance beyond cut-off, **551**
metal, e.m. radiation in, theory of, **2708**
nearly cylindrical, mode-conversion losses in, **1862**
non-uniform, propagation in, **1078**
with periodic structure, properties of, **2706**
principal waves in, **812**
problems of, application of network equations to, **56**
propagation of e.m. waves in, **278**
propagation of e.m. waves in tube with coaxial d.c. discharge, **279**
radiation from, energy considerations and Kottler's formulae, **2131**
rectangular, non-uniform, field in, **550**, theory of, **31**
    rubber model for studying e.m. waves in, **1861**
    slotted, equivalent circuits for, **(A)1338**
    theory of, **1860**
reflection cancellation in, **2128**
slotted, as aerials, **814**, **2129**
slotted-line sections, new type, **1587**
transmission in, **2973**
and transmission lines, resonant, impedance of, **1074**
Wavemeters, differential, use of waveguide interferometers as, **162**
Waves, e.m., in bounded magneto-ionic media, **(A)2609**
    calculation of effective phase, group and pulse velocities of, **(A)1482**
    cm-λ, demonstrations with, **1044**, torque and angular momentum of, **354**, velocity as function of path height, **208**
    diffraction by prolate spheroid, **(A)1392**
    diverging, reflection by gyrostatic medium, **3019**
    escape from sun's atmosphere, **1909**
    focusing of, **1132**, **1664**
    in ionized medium, experiments on, **2768**, theory of, **2490**
    mm-λ, survey, **315**
    plane, angular spectrum of, relation to polar diagram and aperture distribution, **1062**
        attenuation by obstacles, **601**
        scattering by conducting hemisphere or hemispherical shell, **(A)1392**
    production by dense electron beams in crossed fields, **1667**
    regular, vectorial space of, **1748**
    standing, automatic indicator for, **2567**
    ultra-short, technique and applications of, **2101**
    velocity of, **206**, **1484**, **1751**, **2010**, measurement by shoran, **2610**, and permittivity of air, **(A)2489**
    0.1-mm, characteristics of, **209**
free-space, impedance of, **607**; **876**, **(C)1666**; **877**, **(D)1397**
space-charge, increasing, **874**

X

X-ray tubes, high-intensity, with focused beam, **1479**

ERRATA

In "Abstracts and References" throughout the year.

Abstract No. 102 Cancel 526.92 in the U.D.C. number.
,, ,, 188 In title, for 'inductance' read 'induction'.
,, ,, 876 For 'Vol. 29' read 'Vol. 30'.
,, ,, 919 For 'Vol. 29' read 'Vol. 30'.
,, ,, 998 For 'Vol. 29' read 'Vol. 30'.
,, ,, 1018 For 'Vol. 29' read 'Vol. 30'.
,, ,, 1107 For 'Vol. 29' read 'Vol. 30'.
,, ,, 1120 For 'Vol. 29' read 'Vol. 30'.
,, ,, 1125 In the U.D.C. number, for 530 081 read 53.081.
,, ,, 1258 For 'J. R. Duthil' read 'J. R. Dutilh'.
,, ,, 1294 For 'Vol. 29' read 'Vol. 30'.
,, ,, 1325 Insert as authors P. Chavasse and R. Lehmann.
,, ,, 1561 For 'J. L. van Meter' read 'J. L. Van Meter'.
,, ,, 1616 For 'M. Leroy' read 'R. Leroy'.
,, ,, 1922 For 'L. Spiers & W. P. Jolly' read 'W. P. Jolly'.
,, ,, 2432 For 'F. K. Howard' read F. K. Goward'.

U.D.C. Changes

Distortion 621.3.018.78†
Pulses 621.3.015.7†
Radiation counters 621.387†

* * *

LIST OF JOURNALS

A selection of the journals which are regularly scanned is given below, together with the addresses of publishers or editorial offices and the abbreviations of titles as used in the Abstracts and References. Applications for copies of any journal should be made to the addresses given.

The full title of each journal is given first and is followed by the address, the abbreviated title being shown within parentheses. In a few cases the nature of a journal is indicated, where neither the title nor the address shows it clearly.

A

Acta Polytechnica, Royal Swedish Academy of Engineering Sciences, Stockholm, Sweden. (*Acta polyt., Stockholm*)
Alta Frequenza, Associazione Elettrotecnica Italiana, Milano (202), Via S. Paolo 10, Italy. (*Alta Frequenza*)
Analytical Chemistry, American Chemical Society, 1155 Sixteenth Street NW, Washington 6, D.C., U.S.A. (*Anal. Chem.*)
Annalen der Physik, J. A. Barth, Leipzig C1, Salomonstrasse 18B, Germany. (*Ann. Phys., Lpz.*)
Annales de Physique, Masson & Cie, 120 Boulevard Saint-Germain, Paris 6^e, France. (*Ann. Phys., Paris*)
Annales de Radioélectricité, 23 Rue du Maroc, Paris 19^e, France. (*Ann. Radioélect.*)
Annales des Télécommunications, 165 Rue de Sèvres, 3 & 5 Boulevard Pasteur, Paris 15^e, France. (*Ann. Télécommun.*)
Annali di Geofisica, Istituto Nazionale di Geofisica, Città universitaria, Rome, Italy. (*Ann. Geofis.*)
Applied Scientific Research, Martinus Nijhoff, Lange Voorhout 9, 's-Gravenhage, Holland. (*Appl. sci. Res.*)
Archiv der elektrischen Übertragung, Wiesbaden-Biebrich, Mühlweg 2, Germany. (*Arch. elekt. Übertragung*)
Archiv für Elektrotechnik, Springer Verlag, Berlin-Charlottenburg 2, Jebensstrasse 1, *or* Heidelberg, Neuenheimer Landstrasse 24, Germany. (*Arch. Elektrotech.*)
Archiv für technisches Messen, R. Oldenbourg Verlag, München, Lotzbeckstrasse 2b, Germany. (*Arch. tech. Messen*)
Arkiv för Fysik, published for Royal Swedish Academy of Sciences by Almqvist & Wiksells Boktryckeri A.B., Stockholm, Sweden. (*Ark. Fys.*)
A.S.T.M. Bulletin, 20th and Northampton Streets, Easton, Pa, U.S.A. (*A.S.T.M. Bull.*)
Audio Engineering, Radio Magazines Inc., 10 McGovern Avenue, Lancaster, Pa, U.S.A. (*Audio Engng*)
Australian Journal of Applied Science, Commonwealth Scientific and Industrial Research Organization, 314 Albert Street, East Melbourne C2, Australia. (*Aust. J. appl. Sci.*)
Australian Journal of Instrument Technology, 414 Collins Street, Melbourne, Australia. (*Aust. J. Instrum. Tech.*)
Australian Journal of Scientific Research (Series A), 314 Albert Street, East Melbourne C2, Australia. (*Aust. J. sci. Res., Ser. A*)
A.W.A. Technical Review, Amalgamated Wireless (Australasia) Ltd, Sydney, Australia. (*A. W. A. tech. Rev.*)

B

B.B.C. Quarterly, British Broadcasting Corporation, 35 Marylebone High Street, London, W.1, England. (*B.B.C. Quart.*)
Beama Journal, British Electrical and Allied Manufacturers' Association, 36 Kingsway, London, W.C.2, England. (*Beama J.*)
Bell Laboratories Record, 463 West Street, New York 14, N.Y., U.S.A. (*Bell Lab. Rec.*)
Bell System Technical Journal, American Telephone and Telegraph Company, 195 Broadway, New York 7, N.Y., U.S.A. (*Bell Syst. tech. J.*)
British Journal of Applied Physics, 47 Belgrave Square, London, S.W.1, England. (*Brit. J. appl. Phys.*)
Brown Boveri Review, Artillery Mansions, 75 Victoria Street, London, S.W.1, England. (*Brown Boveri Rev.*)
Bulletin de l'Académie des Sciences de l'U.R.S.S., (*a*) série physique, (*b*) série géographique et géophysique, (*c*) classe sciences techniques, (In Russian), Academy of Sciences, Moscow, U.S.S.R. (*Bull. Acad. Sci. U.R.S.S.,* (*a*) *sér. phys.,* (*b*) *sér. géogr. géophys.,* (*c*) *tech. Sci.*)
Bulletin of the American Meteorological Society, Executive Secretary, K. C. Spengler, 5 Joy Street, Boston 8, Mass., U.S.A. (*Bull. Amer. met. Soc.*)
Bulletin de l'Association suisse des Électriciens, 301 Seefeldstrasse, Zürich 8, Switzerland. (*Bull. schweiz. elektrotech. Ver.*)
Bulletin de la Société française des Électriciens, 8–14 Avenue Pierre Larousse, Malakoff (Seine), France. (*Bull. Soc. franç. Élect.*)
Bulletin technique de la Suisse romande, F. Rouge & Cie, Lausanne, Switzerland. (*Bull. tech. Suisse romande*)

C

Câbles et Transmission, Sotelec, 16 Rue de la Baume, Paris 8^e, France. (*Câbles & Transmission, Paris*)
Canadian Journal of Research (Sections A, B and F), National Research Council, Ottawa, Canada. (*Canad. J. Res.*)
Chalmers tekniska Högskolas Handlingar, N. J. Gumperts Bokhandel, Göteborg, Sweden. (*Chalmers tekn. Hogsk. Handl.*)
Communication News, Philips' Telecommunication Industries, Hilversum, Holland. (*Commun. News*)
Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences, Gauthier-Villars, Quai des Grands Augustins 55, Paris, France. (*C. R. Acad. Sci., Paris*)
Comptes Rendus (Doklady) de l'Académie des Sciences de l'U.R.S.S., (In Russian), Academy of Sciences, Moscow, U.S.S.R. (*C. R. Acad. Sci. U.R.S.S.*)

D

Distribution of Electricity, 51–53 Hatton Garden, London, E.C.1, England. (*Distrib. Elect.*)

E

Electrical Communication, International Telephone and Telegraph Corporation, 67 Broad Street, New York 4, N.Y., U.S.A. (*Elect. Commun.*)
Electrical Engineering, Journal of the American Institute of Electrical Engineers, 500 Fifth Avenue, New York 18, N.Y., U.S.A. (*Elect. Engng, N.Y.*)
Electrical Manufacturing, 1250 Sixth Avenue, New York 20, N.Y., U.S.A. (*Elect. Mfg, N.Y.*)
Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, England. (*Elect. Times*)
Electrician, Bouverie House, 154 Fleet Street, London, E.C.4, England. (*Electrician*)
Electronic Engineering, 28 Essex Street, London, W.C.2, England. (*Electronic Engng*)
Electronics, 99–129 North Broadway, Albany 1, N.Y., U.S.A. (*Electronics*)
Elektrotechnik, Berlin N.W.7, Dorotheenstrasse 41, Germany. (*Elektrotechnik, Berlin*)
Elektrotechnik und Maschinenbau, Journal of the Elektrotechnischer Verein Österreichs, Springer Verlag, Wien I, Mölkerbastei 5, Austria. (*Elektrotech. u. Maschinenb.*)
Elektrotechnische Zeitschrift, G. Westermann Verlag, Braunschweig, Riddagshäuser Weg 66, Germany. (*Elektrotech. Z.*)
Endeavour, Imperial Chemical Industries, Nobel House, Buckingham Gate, London, S.W.1, England. (*Endeavour*)
Engineer, 28 Essex Street, London, W.C.2, England. (*Engineer, Lond.*)
Engineering, 35 & 36 Bedford Street, London, W.C.2, England. (*Engineering, Lond.*)
Ericsson Review, Stockholm 32, Sweden. (*Ericsson Rev.*)

F

Fernmeldetechnische Zeitschrift, F. Vieweg & Sohn, Braunschweig, Burgplatz 1, Germany. (*Fernmeldetech. Z.*)
FM-TV, 264 Main Street, Great Barrington, Mass., U.S.A. (*FM-TV*)
Frequenz, Schiele & Schön, Berlin, S.W.29, Boppstrasse 10, Germany. (*Frequenz*)
Funk und Ton, Verlag für Radio-Foto-Kinotechnik G.m.b.H., Berlin-Borsigwalde, Eichborndamm 141–167, Germany. (*Funk u. Ton*)

G

G.E.C. Journal, General Electric Company, Magnet House, Kingsway, London, W.C.2, England. (*G.E.C. J.*)
General Electric Review, General Electric Company, 1 River Road, Schenectady 5, N.Y., U.S.A. (*Gen. elect. Rev.*)
General Radio Experimenter, General Radio Company, 275 Massachusetts Avenue, Cambridge 39, Mass., U.S.A. (*Gen. Radio Exp.*)

H

Helvetica Physica Acta, Journal of the Société suisse de Physique, Éditions Birkhäuser, Bâle, Switzerland. (*Helv. phys. Acta*)
HF, 55 Rue Defacqz, Brussels, Belgium. (*HF, Brussels*)

I

Indian Journal of Physics, (and Proceedings of the Indian Association for the Cultivation of Science), 210 Bowbazar Street, Calcutta, India (*Indian J. Phys.*)
Industrial and Engineering Chemistry, American Chemical Society, 1155 Sixteenth Street NW, Washington 6, D.C., U.S.A. (*Industr. Engng Chem.*)

J

Journal of the Acoustical Society of America, American Institute of Physics, 57 East 55th Street, New York 22, N.Y., U.S.A. (*J. acoust. Soc. Amer.*)

Journal of Applied Physics, American Institute of Physics, 57 East 55th Street, New York 22, N.Y., U.S.A. (*J. appl. Phys.*)

Journal of the British Institution of Radio Engineers, 9 Bedford Square, London, W.C.1, England. (*J. Brit. Instn Radio Engrs*)

Journal of the Franklin Institute, Prince and Lemon Streets, Lancaster, Pa, U.S.A. (*J. Franklin Inst.*)

Journal of Geophysical Research, Johns Hopkins Press, Baltimore 18, Maryland, U.S.A. (*J. geophys. Res.*)

Journal of the Institution of Engineers, Australia, Science House, Gloucester & Essex Streets, Sydney, Australia. (*J. Instn Engrs Aust.*)

Journal of Mathematics and Physics, Massachusetts Institute of Technology, Cambridge 39, Mass., U.S.A. (*J. Math. Phys.*)

Journal of Metals, American Institute of Mining and Metallurgical Engineers Inc., 29 West 39th Street, New York 18, N.Y., U.S.A. (*J. Metals*)

Journal of the Optical Society of America, American Institute of Physics, 57 East 55th Street, New York 22, N.Y., U.S.A. (*J. opt. Soc. Amer.*)

Journal de Physique et le Radium, 12 Place Henri-Bergson, Paris, 8e France. (*J. Phys. Radium*)

Journal des Recherches du Centre national de la Recherche scientifique, 13 Quai Anatole France, Paris 7e, France. (*J. Rech. Centre nat. Rech. sci.*)

Journal of Research of the National Bureau of Standards, U.S. Government Printing Office, Washington, D.C., U.S.A. (*Bur. Stand. J. Res.*)

Journal of Scientific Instruments, 47 Belgrave Square, London, S.W.1. England. (*J. sci. Instrum.*)

Journal of the Society of Glass Technology, Secretary, J. H. Partridge. Elmfield, Northumberland Road, Sheffield 10, England. (*J. Soc. Glass Tech.*)

Journal of the Society of Motion Picture and Television Engineers, 342 Madison Avenue, New York 17, N.Y., U.S.A. (*J. Soc. Mot. Pict. Televis. Engrs*)

Journal of the Television Society, G. Parr (Ed.), 68 Compton Road, London, N.21, England. (*J. Televis. Soc.*)

L

Light Metals, Bowling Green Lane, London, E.C.1, England. (*Light Metals*)

M

Machinery, Clifton House, 83–117 Euston Road, London, N.W.1, England. (*Machinery, Lond.*)

Marconi Review, Marconi House, Chelmsford, England. (*Marconi Rev.*)

Materials and Methods, Reinhold Publishing Corporation, 330 West 42nd Street, New York 18, N.Y., U.S.A. (*Materials & Methods*)

Metal Industry, Louis Cassier Company Ltd, Dorset House, Stamford Street, London, S.E.1, England. (*Metal Ind., Lond.*)

Metal Progress, American Society for Metals, 7301 Euclid Avenue, Cleveland 3, Ohio, U.S.A. (*Metal Progress*)

Metal Treatment, 49 Wellington Street, London, W.C.2, England. (*Metal Treatm.*)

Metallurgia, Kennedy Press Ltd, 21 Bedford Street, London, W.C.2. England. (*Metallurgia, Manchr*)

Meteorological Magazine, His Majesty's Stationery Office, York House, Kingsway, London, W.C.2, England. (*Met. Mag.*)

Microtecnic, Lausanne, Switzerland. (*Microtecnic, Lausanne*)

Modern Plastics, 122 East 42nd Street, New York 17, N.Y., U.S.A. (*Mod. Plast.*)

Monthly Notices of the Royal Astronomical Society, Burlington House, London, W.1, England. (*Mon. Not. R. astr. Soc.*)

N

Nature, Macmillan & Co. Ltd, St. Martin's Street, London, W.C.2, England. (*Nature, Lond.*)

Naturwissenschaften, Springer Verlag, Berlin-Charlottenburg 2, Jebensstrasse 1, Germany. (*Naturwissenschaften*)

Nucleonics, 212 East York Street, York, Pa, U.S.A. (*Nucleonics*)

O

Observatory, Royal Observatory, Greenwich, London, S.E.10, England. (*Observatory*)

Onde électrique, 40 Rue de Seine, Paris 6e, France. (*Onde élect.*)

Optik, Wissenschaftliche Verlagsgesellschaft, Stuttgart 1, Postfach 40. Germany. (*Optik*)

Österreichische Zeitschrift für Telegraphen- Telephon- Funk- und Fernsehtechnik, Springer Verlag, Wien 1, Mölkerbastei 5, Austria. (*Öst. Z. Telegr. Teleph. Funk Fernsehtech.*)

P

Philips Research Reports, N.V. Philips Gloeilampenfabrieken, Eindhoven, Holland. (*Philips Res. Rep.*)

Philips Technical Review (as for **Philips Research Reports**). (*Philips tech. Rev.*)

Philosophical Magazine, Taylor & Francis Ltd, Red Lion Court, Fleet Street, London, E.C.4, England. (*Phil. Mag.*)

Philosophical Transactions of the Royal Society, Cambridge University Press, Bentley House, London, N.W.1, England. (*Philos. Trans.*)

Physica, Journal of the Dutch Physical Society. Martinus Nijhoff, Lange Voorhout 9, 's-Gravenhage, Holland. (*Physica,'s Grav.*)

Physical Review, 57 East 55th Street, New York 22, N.Y., U.S.A. (*Phys. Rev.*)

Post Office Electrical Engineers' Journal, Engineer-in-Chief's Office, Alder House, Aldersgate Street, London, E.C.1, England. (*P.O. elect. Engrs' J.*)

Poste e Telecomunicazioni, Ministero P.T., Viale Aventino 19, Roma, Italy. (*Poste e Telecomunicazioni*)

Proceedings of the Cambridge Philosophical Society, Cambridge University Press, Bentley House, London, N.W.1, England. (*Proc. Camb. phil. Soc.*)

Proceedings of the Institute of Radio Engineers, 1 East 79th Street, New York 21, N.Y., U.S.A. (*Proc. Inst. Radio Engrs*)

Proceedings of the Institution of Electrical Engineers, Parts I, II & III, Savoy Place, London, W.C.2, England. (*Proc. Instn elect. Engrs*)

Proceedings of the Institution of Radio Engineers, Australia, Science House, Gloucester Street, Sydney, N.S.W., Australia. (*Proc. Instn Radio Engrs, Aust.*)

Proceedings of the National Electronics Conference, 852 East 83rd Street. Chicago 19, Illinois, U.S.A. (*Proc. nat. Electronics Conference, Chicago*)

Proceedings of the Physical Society, 1 Lowther Gardens, Prince Consort Road, London, S.W.7, England. (*Proc. phys. Soc.*)

Proceedings of the Radio Club of America, 11 West 42nd Street, New York, N.Y., U.S.A. (*Proc. Radio Cl. Amer.*)

Proceedings of the Royal Society, Cambridge University Press, Bentley House, London, N.W.1, England. (*Proc. roy. Soc.*)

Q

QST, American Radio Relay League Inc., 38 La Salle Road, West Hartford 7, Conn., U.S.A. (*QST*)

Quarterly of Applied Mathematics, Brown University, Providence 12, R.I., U.S.A. (*Quart. appl. Math.*)

Quarterly Journal of the Royal Meteorological Society, 49 Cromwell Road, London, S.W.7, England. (*Quart. J. R. met. Soc.*)

R

Radio française, 92 Rue Bonaparte, Paris 6e, France. (*Radio franç.*)

Radio professionnelle belge, Avenue Molière 1, Brussels, Belgium. (*Radio prof. belge*)

Radio professionnelle, 81 Rue de la Pompe, Paris 16e, France. (*Radio prof., Paris*)

Radio Technical Digest (Edition française), 122 Boulevard Murat, Paris 16e, France. (*Radio tech. Dig., Édn franç.*)

Radio Technik, Wien VI, Mariahilferstrasse 71, Austria. (*Radio Tech., Vienna*)

Radio & Television News, Ziff Davis Publishing Company, 185 N. Wabash Avenue, Chicago 1, Illinois, U.S.A. (*Radio & Televis. News*)

RCA Review, RCA Laboratories Division, Princeton, N.J., U.S.A. (*RCA Rev.*)

Reports on Progress in Physics, The Physical Society, 1 Lowther Gardens, Prince Consort Road, London, S.W.7, England. (*Rep. Progr. Phys.*)

Research, Butterworth's Scientific Publications Ltd, 4–6 Bell Yard, Temple Bar, London, W.C.2, England. (*Research, Lond.*)

Review of Scientific Instruments, 57 East 55th Street, New York 22, N.Y., U.S.A. (*Rev. sci. Instrum.*)

Reviews of Modern Physics, 57 East 55th Street, New York 22, N.Y., U.S.A. (*Rev. mod. Phys.*)

Revista de Telecomunicación, Palacio de Comunicaciones, Madrid, Spain. (*Rev. Telecomunicación, Madrid*)

Revue générale de l'Electricité, 12 Place Henri Bergson, Paris 8e, France. (*Rev. gén. Élect.*)

Revue d'Optique, 3 & 5 Boulevard Pasteur, Paris 15e, France. (*Rev. d'Optique*)

Revue scientifique, 4 Rue Pomereu, Paris 16e, France. (*Rev. sci., Paris*)

Revue technique Compagnie française Thomson-Houston, 173 Boulevard Haussmann, Paris, France. (*Rev. tech. Comp. franç. Thomson-Houston*)

Ricerca scientifica, Roma, Piazzale delle Scienze 7, Italy. (*Ricerca sci.*)

R.S.G.B. Bulletin, New Ruskin House, Little Russell Street, London, W.C.1, England. (*R.S.G.B. Bull.*)

S

Schweizer Archiv für angewandte Wissenschaft und Technik, Buchdruckerei Vogt-Schild, Solothurn, Switzerland. (*Schweiz. Arch. angew. Wiss. Tech.*)

Scientific Monthly, 10 McGovern Avenue, Lancaster, Pa, U.S.A. (*Sci. Mon.*)

Sylvania Technologist, Lawrence Street, Flushing, N.Y., U.S.A. (*Sylvania Technologist*)

T

Technical Bulletin of the National Bureau of Standards, U.S. Government Printing Office, Washington 25, D.C., U.S.A. (*Tech. Bull. nat. Bur. Stand.*)

Technique moderne, 92 Rue Bonaparte, Paris 6e, France. (*Tech. mod., Paris*)

Technische Mitteilungen, Journal of the Swiss Post Office, Direction générale PTT, Berne, Speichergasse 6, Switzerland. (*Tech. Mitt. schweiz. Telegr.-TelephVerw.*)

Tele-Tech, 480 Lexington Avenue, New York 17, N.Y., U.S.A. (*Tele-Tech*)

Télévision, 9 Rue Jacob, Paris 6e, France. (*Télévision*)

Television Engineering, Bryan Davis Publishing Co. Inc., 52 Vanderbilt Avenue, New York 17, N.Y., U.S.A. (*TV Engng, N.Y.*)

Tesla Technical Reports, KOVO Ltd, Mezibranská, Praha II, Czechoslovakia. (*Tesla tech. Rep., Prague*)

Tijdschrift van het Nederlands Radiogenootschap, Oude Utrechtseweg 8, Baarn, Holland. (*Tijdschr. ned. Radiogenoot.*)

Toute la Radio, 9 Rue Jacob, Paris 6e, France. (*Toute la Radio*)

Transactions of the American Geophysical Union, National Academy of Sciences, Washington, D.C., U.S.A. (*Trans. Amer. geophys. Union*)

Transactions of the American Institute of Electrical Engineers, 33 West 39th Street, New York 18, N.Y., U.S.A. (*Trans. Amer. Inst. elect. Engrs*)

Transactions of the South African Institute of Electrical Engineers, corner Marshall and Holland Streets, Johannesburg, S. Africa. (*Trans. S. Afr. Inst. elect. Engrs*)

T.S.F. pour Tous, 40 Rue de Seine, Paris 6e, France. (*T.S.F. pour Tous*

V

Le Vide, Journal of the Société française des Ingénieurs Techniciens du Vide, 44 Rue de Rennes, Paris 6e, France. (*Le Vide*)

W

Weather, 49 Cromwell Road, London, S.W.7, England. (*Weather, Lond.*

Wireless Engineer, Dorset House, Stamford Street, London, S.E.1 England. (*Wireless Engr*)

Wireless World, (as for **Wireless Engineer**). (*Wireless World*)

Z

Zeitschrift für angewandte Physik, Springer Verlag, Berlin-Charlottenburg 2, Jebensstrasse 1, Germany. (*Z. angew. Phys.*)

Zeitschrift für Meteorologie, Deutscher Zentralverlag, Berlin O 17, Michaelkirchstrasse 17, Germany. (*Z. Met.*)

Zeitschrift für Naturforschung, Tübingen, Johannesweg 11, Germany. (*Z. Naturf.*)

Zeitschrift für Physik, Springer Verlag, Berlin-Charlottenburg 2, Jebensstrasse 1, Germany. (*Z. Phys.*)

Zhurnal eksperimentalnoi y teoreticheskoi Fiziki, (In Russian), Academy of Sciences, Moscow, U.S.S.R. (*Zh. eksp. teor. Fiz.*)

Zhurnal tekhnicheskoi Fiziki, (In Russian), Academy of Sciences, Moscow, U.S.S.R. (*Zh. tekh. Fiz.*)

Section VI—1951

Index to

Abstracts and References

This section contains an index, listed separately by author and by subject, for all Abstracts and References published in PROCEEDINGS OF THE IRE from February, 1951, through January, 1952.

AUTHOR INDEX

AUTHOR INDEX—A name followed by "and" is that of the first author of a jointly written paper, while the word "with" indicates that the name indexed is that of the second author.

A

Abadie, P., I. Épelboin and B. Pistoulet, properties of magnetic powders at u.h.f., **378**
Abbott, F. R., and C. R. Fisher, directivity produced by parasite parallel to vertical aerial, **41**
Abel, W., long-distance back-scatter and determination of skip distance and m.u.f., **(A)2799**
Abelès, F., e.m. wave propagation in stratified media, **857, 1340, 2157**
Abraham, W. G., F. L. Salisbury and S. F. Varian, klystron amplifier for u.h.f. television, **(A)2304**
—— and others, K-band amplifier klystron, **(A)2304**
—— with others, crystal control of 4-kW 1036-Mc/s transmitter, **(A)2298**
Abramowitz, M., tables of integrals of Struve functions, **139**
Ackroyd, J. O., with J. H. Combridge, upper limit of frequency for human hearing, **(D)2322**
Adams, P. H., developments in dry batteries, **3121**
Adams, R. J., and K. S. Kelleher, pattern calculations for paraboloid aerials of elliptic aperture, **39**
Addink, C. C. J., calibration of tuning forks, **2234**
Aden, A. L., e.m. scattering from spheres, **2417**
—— J. T. deBettencourt and A. T. Waterman, Jr, ionospheric radio-wave polarization, **1464**
Adler, R., amplifier with negative-resistance load, **(D)599**; miniature travelling-wave valve for lower u.h.f. band, **(A)2304**
Adorian, P., television distribution over short wire lines, **239**
Affleck, J. H., with E. B. Hensley, BaO-on-W cathode interface compound, **263, 2054**
Agar, A. W., with R. S. M. Revell, focusing in electron microscopy, **1218**
Ahmed, Rais, nonlinear method of circuit analysis, **585**
Aigrain, P., h.v. reverse current of Ge diodes, **1529**
—— C. Dugas and J. Germain, adsorption on semiconductors, **1667**
Aikens, A. J., and L. Y. Lacy, 450-Mc/s mobile R/T transmission tests in New York, **734, 1766**
Aisberg, E., stereophonic broadcasting experiments, **1061**
Aitchison, R. E., preparation of photoconducting CdS, **2724**
Akhiezer, A. I., and G. Ya. Lyubarski, excitation of oscillations in waveguide by linear aerial, **2335**
Akulov, N. S., Z. I. Alizade and K. P. Belov, magnetostriction of Fe/Pt alloys, **370**
Albersheim, W. J., measurement techniques for radio relays, **(A)1958**
—— and J. P. Schafer, echo distortion in f.m. transmission of frequency-division-multiplex signals, **(A)2265**
Albert, A. L., Electrical Communication, **(B)454**
Alden, J. M., with others, static magnetic memory unit for low-cost computers, **1422**
Aldrich, D. F., with others, speed of electronic switching circuits, **(C)294**
Alexander, F. W., standard musical pitch, **1820**
Alexander, J. W., amplification of pulse-form modulated voltages, **76**
Alfvén, H., theory of magnetic storms and auroras, **(D)2993**
Alger, P. L., with J. J. Smith, finite representation of impulse functions, **(A)2218**; Heaviside's operational calculus and Schwartz functions, **932**
Alixant, M., colour television, **2026**
—— with N. Mikhnewitch, Williamson very-high-fidelity amplifier, **1834**
Alizade, Z. I., magnetostriction of Fe/Pd and Ni/Pd alloys, **1935**
—— with others, magnetostriction of Fe/Pt alloys, **370**
Alkemade, C. T. J., and P. M. Endt, coupling of a.c. galvanometer to amplifier, **2480**
Allard, L. S., 'ideal' post-deflection-acceleration c.r. tube, **1032**
—— and R. T. Hill, switch and storage tubes, **3180**
Allcock, G. McK., variability of sky-wave signals under conditions of absorption, **728**
Allcock, H. J., and J. R. Jones, The Nomogram, **(B)1423**
Alldredge, L. R., with L. H. Rumbaugh, airborne equipment for geomagnetic measurements, **1442**
Allen, C. C., with H. R. Meahl, calibration of ammeters above 100 Mc/s, **(A)**[illegible]
Allen, C. H., finite amplitude distortion in spherically diverging sound wave, **(A)520**
—— with J. P. Walker, sonic wind and static pressure in intense sound fields, **(A)518**
Allen, C. W., solar constant, **102**
—— and C. S. Gum, survey of galactic radio-noise at 200 Mc/s, **867**
—— with R. v. d. R. Woolley, ultraviolet emission from chromosphere, **1632**
—— with others, radio observations of two large solar disturbances, **2168**
Allen, E. W., with K. A. Norton, variation with frequency of range of f.m. and television transmitters, **2281**
Allen, J. E., voltage gradients in high-current sparks, **852**
Allen, K. W., with J. T. Dewan, recorder for μs-pulse amplitudes, **402**
Allis, W. P., with others, effect of magnetic field on breakdown of gases at u.h.f., **1134**
Allred, C. M., dissipative- and piston-attenuator corrections, **(A)1958**
Alpert, N., J. Luongo and W. Wiener, 32-channel high-speed commutator, **295**
Alsberg, D. A., sweep-frequency method of vector-impedance measurement, **(A)1958**
Amdursky, M. E., with others, low-reflection picture tubes, **1501**
Ament, W. S., wave propagation over rough surfaces, **(A)2799**
Amey, W. G., with others, stabilized wide-band d.c. amplifier, **849**
Amoignon, J., with others, effect of radioactivity on thermoelectronic emission, **2301**
Amos, B., and W. Heiser, internal television receiver interference, **(A)2292**
Ancell, J. E., with others, comparison of absorption coefficients, **(A)1811**
Anders, H., spark transmitter for lightly damped cm waves, **2775**
Anderson, L. J., with others, American Standard Z24.9-1949 for coupler calibration of earphones, **21**
Anderson, R. V., autocalling system, **2015**
Anderson, T. N., waveguide switches for commercial and military applications, **(A)2100**
Andreev, V. D., L. E. Levina and B. G. Mendelev, electric field in 3-electrode gas-discharge tube, **2874**
Andres, P. G., Survey of Modern Electronics, **(B)2514**
Andrews, C. L., diffraction pattern of microwaves near rods, **2159**
Andrews, D. R., broadcast tape speed control, **2900**
—— with others, methods of calibrating frequency records, **583**
Andrieux, P., standardized magnetic circuits of French PTT, **2934**
—— and — Fraize, production control of permeability, **2233**
Angel, Y., Réception Radiophonique, Parasites, **(B)2825**
Ansbacher, F., and W. Ehrenberg, electron-bombardment conductivity of dielectric films, **2196**
Appleton, E., ionospheric equator in F_2 layer, **882**
Ardillon, J. M., with others, earth's magnetism and radio wave propagation, **2806**
Arditi, M., A. G. Clavier and P. Parzen, travelling-wave-valve amplifier, **(A)**[illegible]
Arends, J. L., a.f.c. for s.s.b. receivers, **2003**
Arfin, B., with G. A. Espersen, l.v. tunable X-band magnetron, **3184**
Argence, E., refractive index of ionized medium in earth's magnetic field, **3094**
—— with others, radio propagation between Noumea and Adélie Land, **1231**
Arnold, A. H. M., current transformers, dielectric admittances in, **1089**, toroidal, effect of capacitance on design of, **1090**
Arnold, J., electronic tracing of valve characteristics, **1436**
Arnold, O. F. A., WBSM and WBSM-FM, New Bedford, Mass., **1246**
Arnold, W. R., 500-kV generator using Se rectifiers, **745**
Arnoldi, W. E., minimized iterations in solution of matrix eigenvalue problem, **2463**
Aronoff, M., mode conversion measurements in circular waveguide, **(A)2100**
Artman, R. G., with K. H. Cook, u.h.f. television propagation measurements, [illegible]
Aschen, R., measurement of time constants, **1199**; voltage doubler with saturable reactor, **1001**
Aseltine, J. A., with D. L. Trautman, amplifier synthesis on equal-ripple basis, **(A)2122**
Ashton, J. P., design of commercial hearing aids, **1840**
Ashwell, G. E., with others, direction of arrival of ionospheric waves, **2804**
Aske, V. H., gain-doubling frequency converters, **1481**
Aspinall, A., J. A. Clegg and G. S. Hawkins, radio echo equipment for determination of meteor radiants, **3003**
Aspinall, E., master hearing aid, **1839**
Åström, E., waves in ionized gas, **2152**
Atkinson, P. D., with H. M. Gale, series-connected magnetic amplifier, **(D)1093, (D)1581**
Atterling, H., acceleration chamber and dees for Stockholm cyclotron, **2254**
Attura, G. M., servo-modulator for very-low-level d.c. measurements, **(A)2122**
Attwood, S. S., surface-wave propagation over coated plane conductor, **2097**
Atwood, J. B., diversity receiving system for facsimile, **3124**
Aubort, E. J., stratovision tests in U.S.A., **242**
Augustin, O., and W. Menzel, solar and terrestrial phenomena during sudden ionospheric disturbance, 19th Nov. 1949, **885**
Auwärter, M., reflection reduction in optics, **81**
Axon, P. E., with E. D. Daniel, accidental printing in magnetic-tape recording, **810**

B

Babcock, W. C., and H. W. Nylund, aerial systems for multichannel mobile R/T, **569**
Babin, —, communications technique in French aviation, **2853**
Bachman, W. S., application of damping to pickup arms, **(A)2082**
Backus, J., design of cyclotron oscillators, **1981**
Badenach, R. M., and R. E. Gillman, development of navigation aids for civil aviation, **897**
v. Baeckmann, W., with H. Severin, diffraction of cm e.m. waves by disks, **2693**
Baer, R. H., chart of cathode-follower response, **313**
Bahr, R., Jr, with others, semi-automatic manufacture of audio and video equipment, **(A)2292**
Bailey, R., aperiodic aerials for ionospheric recorders, **2646**
—— with R. Naismith, automatic ionospheric recorder for 0·55–17 Mc/s, **1191**
Bailey, V. A., relativistic electromagneto-ionic theory of wave propagation, **1351**
Baker, E. B., application of double-superheterodyne principle to dielectric measurements, **1960**
Baker, G. M. K., with others, Television, Vols. 5 and 6, **(B)2038**
Baker, G. W., heater cathode tube for portable battery-operated equipment, **(A)2304**
Bakker, C. J., synchrocyclotron at Amsterdam, **422**
Balchin, D. B., with C. W. Sowton, new London R/T terminal, **2539**
Balcombe, F. G., and D. E. Watt-Carter, Burnham radio station, **452**
Baldes, E. J., P. A. Nelson and J. F. Herrick, heating of bone and bone marrow by ultrasonic radiation, **(A)527**
Baldinger, E., with P. Schmid, wide-band amplifier for c.r.o. observation of transients, **315**
Baldwin, M. W., Jr, subjective sharpness of additive colour pictures, **(A)2292**
Baldwin, T., and J. H. Littlewood, null method for gain and phase shift of l.f. amplifiers, **1728**
Ball, I. D. L., electric strength of polyvinyl alcohol, **2748**
Bancie-Grillot, M., with E. Grillot, state of oxidation and luminescence colour of ZnS-Cu, **645**
Banerjee, S. S., and R. R. Mehrotra, multiple reflections and undulations in F_2 region, **2526**; radiation resistance of skew-wire r.f. transmission lines, **817**
Banfi, A., television in Italy, **472**
Baños, A., Jr, D. S. Saxon and H. Gruen, propagation characteristics in coaxial structure with two dielectrics, **1564**
Banthorpe, C. H., positive feedback in a.f. amplifiers, **850**
Baral, S. S., and A. P. Mitra, ionosphere over Calcutta, Jan. 1945–June 1950, **881**
Baranova, N. A., with Ya. S. Shur, dependence of magnetization curves on temperature in high-coercivity alloys, **2407**
Bardeen, J., hole concentration and characteristics of Ge point contacts, [illegible]
Bardell, P. R., with others, properties and tests of magnetic powders, **1948**
Barden, S. E., resonance damping, at injection, in betatrons and synchrotrons, **1448**
Bardsley, W., with S. Tolansky, interferometric studies of quartz-plate vibration, **1939**
Barlow, H. M., surface-wave transmission line, **(D)1300**
—— and A. L. Cullen, Micro-Wave Measurements, **(B)1203**
Barnard, V., height of thundercloud charges taking part in flash to ground, **1907**
Barnes, B. T., and S. Eros, measurement techniques for dynamic characteristics of low-pressure arc, **1135**
Barré, M., and K. Rawer, ionosphere observations, in Adélie Land, **112**, in *Commandant Charcot*, **2997**
—— K. Rawer and É. Argence, radio propagation between Noumea and Adélie Land, **1231**
—— with R. Bureau, radiogoniometer measurements of atmospherics in *Commandant Charcot*, **637**
Barrett, R. E., with others, ultrasonic absorption in $MgSO_4$ solutions, **(A)530, 1549**
Barrow, W. L., pulse navigation systems, **362**
—— L. J. Chu and J. J. Jansen, biconical e.m. horns, **(C)2345**
Barrucand, P. A., Mellin transform and applications, **931**
Bartberger, C. L., magnetic field of plane circular loop, **856**
Bartels, J., geomagnetic *K*-indices for Polar Year 1932–1933, **872**; solar and terrestrial phenomena during sudden ionospheric disturbance 19th Nov. 1949, **885**; 27-day variations in F_2-layer critical frequencies at Huancayo, **883**
—— and J. Veldkamp, international data on magnetic disturbances, third quarter 1949, **1370**, first quarter 1950, **630**, second quarter 1950, **870**, third quarter 1950, **1894**, fourth quarter 1950, **2705**
Barter, L. D., graphical solution for feedback amplifiers, **316**
Barthélemy, R., international television, **247**; secondary emission, application to design of television analysers, **1499**, from insulators, measurement of, **1511**
Bartholdson, I., and G. Carlson, 200-kV neutron generator, **2252**
Baruch, J. J., automatic sound-field plotter, **(A)519**
—— with others, design of sound-absorbing ducts, **(A)1811**
Barut, A. O., theory of planar space-charge diode, **2057**
Baş-Taymas, E., electron emission from carburized W and Mo, **1670**; evaporation rate of W in high vacuum, **1029**
Basard, R., with others, phase distortion in feeders, **1067**
Bast, G. H., D. Goedhart and J. F. Schouten, 48-channel carrier telephone system, **739, 2013**
Bate, A. E., with R. W. B. Stephens, Wave Motion and Sound, **(B)1562**
Bateman, R., E. F. Florman and A. Tait, source of error in radio phase-measuring systems, **(D)2433**
Bates, L. F., thermal effects due to magnetization processes in weak fields, **914**
Bauda, A., electronic theory for cloud-height indicator, **2498**
Bauer, B. B., with others, American Standard Z24.9–1949, coupler calibration of earphones, **21**; American standard Z24.4–1949 for pressure calibration of laboratory-standard microphones, **19**
Baum, R. V., and C. D. Morrill, time division multiplier for electronic differential analyser, **(A)2220**
Baumann, E., impedances with prescribed variation of phase angle, **1576**
Baumgartner, W., and N. Schätti, photoelectric effect for Cs-O, Cs-S, Cs-Se and Cs-Te photocathodes, **1797**
—— with N. Schätti, photoelectric effect in alkali/Ge compounds, **364**
Bayard, M., synthesis of Kirchhoff networks, **593**
Bayley, S. T., dielectric properties, of adsorbed water layers on inorganic crystals, **2969**, of solid crystalline proteins etc., **2968**
Beakley, W. R., design of thermistor thermometers, **3067**
Beanland, C. P., with E. T. Wrathall, s.s.b. system of h.f. radio transmission, **2014**
Beatty, E. E., Jr, boundary-layer attenuation of higher-order modes in tubes, **1045, (C)2809**
—— R. H. Bolt and J. Young, sound transmission through single and double walls, **(A)1811**
Beatty, R. W., cascade-connected attenuators, **317**
Beaumariage, D. C., with L. A. Finzi, magnetic-amplifier characteristics, **1092**
—— with others, analysis of feedback magnetic amplifiers, **47**
Beaumont, J. H., Williamson amplifier using Type-6A5 valves, **311**
de Beauregard, O. Costa, Wheeler & Feynman's theory of e.m. interaction, **1137**
Beaverson, W. A., and A. M. Wiggins, second-order differential microphone with single diaphragm, **29**
Bechert, K., tentative nonlinear theory of electrodynamics, **618**
Bechmann, R., contour modes of square plates excited piezoelectrically, **2208**; elastic and piezoelectric constants of EDT crystals, **128**; temperature dependence of quartz resonators, **2741**
Beck, A. C., conductivity measurements at 9 kMc/s, **395**
—— and R. W. Dawson, conductivity measurements at 9 kMc/s, **394**
—— with S. E. Miller, low-loss waveguide transmission, **(A)2100**
Becker, W., attenuation of extraordinary component in E_1 layer, **887**; evaluation of ionosphere observations, **2521**
Bedford, A. V., 'mixed highs' in colour television, **250**
Bedford, L. H., television, camera tubes, **1264**, comparative analysis of standards, **489**
Beers, R. A., W. A. Harris and A. D. Zappacosta, design of mobile equipment for 152–174 Mc/s, **969, 1782**
Beers, Y., with S. A. Korff, solar atmosphere and origin of r.f. radiation, **341**
Beeson, E. J. G., high-temperature-lamp quartz/Mo seals, **381**
Beggs, G. E., Jr, range-adjusting radiosonde recorder, **176**
Begovich, N. A., slot radiators, **(C)2344**
Beitman, M. N., Most-Often-Needed 1950 Radio Diagrams and Servicing Information, **(B)983**
v. Békésy, G., electrical resistance pattern in cochlea of guinea pig, **1556**; microphony produced by touching cochlea partition with vibrating electrode, **1557**
Belevitch, V., 2n-terminal networks, synthesis of, **2128**, theory and application of, **305**
Belgodère, P., and A. Fromageot, Newtonian potentials in design of f.m. amplifiers, **2388**
Beljers, H. G., and W. J. van de Lindt, dielectric measurements with magic Tees, **3053**
—— and J. L. Snoek, gyromagnetic phenomena in ferrites, **652**
Bell, D. A., autocorrelation function, **1180**
Bell, J. F. W., satellite resonances in ultrasonic interferometry, **797**
Bell, P. R., with others, single-channel analyser, **2357**
Belov, K. P., with others, magnetostriction of Fe/Pt alloys, **370**
Belove, C., synthesis of RC networks, **(D)1102**
Benner, A. H., ionospheric absorption at 150 kc/s, **1901, (A)2712**
—— and H. J. Nearhoof, polarimeter for study of l.f. ionospheric echoes, **815**
—— and L. M. Seeberger, graphechon writing characteristics, **3182**
Bennett, A. I., and L. P. Hunter, pulse measurement of inverse-voltage characteristics of Ge point contacts, **1531**
Bennett, A. L., with others, automatic beam blanker for c.r.o., **405**
Bennington, T. W., ionosphere review for 1950 and forecast for 1951, **1903**; world charts in s.w. engineering, [illegible]
—— and R. Morris, reception of London 41·5-Mc/s signals in South Africa, **722**
Benoit, R., thermomagnetic investigation of boroferrites, **653**
Benson, A. C., with others, experimental determination of geomagnetic radial variation, **351**
Benson, F. A., extinction voltages of glow-discharge voltage-regulator valves, **3159**; Voltage Stabilizers, **(B)1255**
—— and R. M. Pearson, pulse generator with fixed repetition rate, **843**
Benson, J. E., H. J. Oyston and B. R. Johnson, television synchronizing-signal generator, **749**
Benson, R. W., with others, performance of audiometers, **1053**
Benson, W. H., with others, attenuation of radio signals by scattering, **2525**
Benz, F., Einführung in die Funktechnik, **(B)1287**; skin effect and current distribution in conductors at h.f., **1613**
Beranek, L. L., developments in studio design, **1833**; physical and electrical constants of direct-radiator loudspeakers, **(A)2082**
—— and others, American Standard Z24.9–1949, coupler calibration of earphones, **21**; American Standard Z24.4–1949, pressure calibration of laboratory-standard microphones, **19**; calculation and measurement of loudness, **2324**
—— with others, calculation and measurement of loudness, **(A)542**; design of sound-absorbing ducts, **(A)1811**
Bergmann, L., application of ultrasonics in testing of materials, **953**
Bergmann, O., with W. Glaser, foci and focal lengths in electron-optics and strong electron lenses, **2505, 2796**
Bergonzat, J., simple test generator for television sets, **2778**
Bergstrand, E., measurement of velocity of light, **324**
Bergtold, F., magnetic leakage at edges of airgaps, **1947**; post-war developments in electroacoustics by Telefunken, **2327**; sound reproduction in halls and open spaces, **2890**
Berk, S., and L. Teitell, effect of fungus growth on insulating tapes, **3025**
Bernardi, L., wide-band amplifiers, **2679**
Berndt, W., aerials for German post-war high-power transmitters, **2341**
Bernhart, J., relation between studio and microphone acoustics, **801**
—— and J. W. Garrett, stereophonic broadcasting of music, **1060**
Bertaux, G., with others, earth's magnetism and radio-wave propagation, **2806**
Bertein, F., low-power electron lenses, **3082**; Marton's method of exploring magnetic or electric fields, **1459**
Berterottière, R., and G. Convert, effects of space charge in travelling-wave valves, **282**
Berz, F., reflection and refraction of microwaves at parallel metal plates, **1138**
Beser, J., with others, mechano-electronic transducer for physiological applications, **2791**
Best, F. P., direction finding at sea, **2188**
de Bettencourt, J. T., with others, ionospheric radio-wave polarization, **1464**
Beurle, R. L., electronic guiding aids for blind people, **1444**
Beurtheret, M., justification for raising standard of broadcast transmissions, **2822**
Beverly, N. E., inflection-point method of measuring Q at v.h.f., **(A)1958**
Beyer, R. T., acoustics bibliography, **2808**
—— with A. Taber Jones, acoustics bibliography, **2809**
—— with others, experimental determination of acoustic wave fronts, **(A)517, 1547**; ultrasonic absorption in $MgSO_4$ solutions, **(A)530, 1549**
Beynon, W. J. G., and G. M. Brown, geophysical and meteorological changes, Jan.–April 1949, **2899**
Bibbero, R. J., temperature rise in electronic equipment, **2549**; valve ratings at high altitudes, **3164**
Bibl, K., ionization distribution beyond E layer, **354**; path of ray in curved ionosphere layer, **1226**
Biermann, L., origin of magnetic field of stars, **2178**
Biguenet, C., cements used in radio-valve construction, **1798**
Billig, E., theory of contact rectification and rectifier breakdown, **3026**; thermal instability of contact rectifiers, **2212**
—— and K. W. Plessner, dielectric dispersion in polycrystalline materials, [illegible]
—— and M. S. Ridout, height of potential barrier in contact rectifiers, **3153**
Bingley, F. J., colorimetry in television, **(A)2292**
Biondi, M. A., microwave gas discharges, **332**
Birabent, R., I-V characteristics of gas-filled photocell with magnetic field, **2040**
Birks, J. B., nuclear scintillation counters, **3087**

Birnbaum, G., fluctuations of atmospheric refractive index at microwave frequencies, **2176**; microwave techniques for small samples of dielectrics, **(A)1958**
—— S. J. Kryder and R. R. Larson, recording atmospheric refractive index for microwaves, **(A)1958**
—— S. J. Kryder and H. Lyons, microwave measurements of dielectric properties of gases, **1426**
Bishop, P. O., and E. J. Harris, d.c. amplifier for biological application, **(C)848**
Blachman, N. M., synchrotron-oscillation resonance, **962**
van Bladel, J., expansion of waveguide field in terms of normal modes, **1302**
—— and T. J. Higgins, cut-off frequency for two-dielectric rectangular waveguides, **1841**
Blaha, F., and J. A. Schedling, display of lines of magnetic force by glow discharge, **1348**
Blanc, D., deterioration of methane-filled G-M counters with external cathode, **968**
Blanc-Lapierre, A., Laplacian stationary aleatory functions, **1691**, harmonic analysis of, **1692**; statistical functions useful for study of background noise, **384**
—— and M. Perrot, conductivity of thin Ag films in strong electric fields, **651**; diffraction and quantity of information, **209**
Blank, A., with J. B. Keller, diffraction and reflection of pulses by wedges and corners, **2963**
Blankenfeld, G., secondary emission from Ni, Mo, MgO and glass, **3150**
Blanton, H. E., carrier compensation for servomechanisms, **993**
Blears, J., vacuum gauge using Pirani cooling of W filament, **(D)640**
Blewett, J. P., with A. I. Pressman, 0·3–4-Mc/s electrically tuned oscillator, **1332**
Blom, J. P., and J. D. Gilchrist, distance-measuring equipment for civil aircraft, **1918**
—— with others, distance-measuring equipment for civil aircraft, **1392**, **1659**
Bloom, L. R., and others, beam analyser, **(A)2226**
Bloom, M. C., with A. von Hippel, selenium electroplating, **671**
Blum, A. I., and N. A. Goryunova, electrical properties of grey tin, **2199**
Blum, E. J., and J. F. Denisse, solar r.f. radiation on 156 and 164 Mc/s, **627**
—— J. F. Denisse and J. L. Steinberg, interpretation of solar-noise jumps, **1359**; low-intensity solar radio storms, **1358**
Blunden, S. F., magnetic-fluid clutch, **1748**
Blunden, W. R., control systems and application to industry, **2494**
Boadle, R. D., aerial polar diagrams by means of models, **575**
Boadway, J. D., condenser aperture device for electron microscopes, **1453**
Bobot, D., with others, space-charge effects in travelling-wave valves with magnetic field, **1022**
Bochirol, L., with L. Weil, measurement of Young's modulus of ferrites, **2737**
Böcker, H., minimum flashover voltage in humid compressed air, **1136**
Bodiou, G., quantum calculus of probabilities in pure cases, **604**
Bodle, R. R., Cheltenham 3-hour-range indices *K*, for Oct.–Dec. 1949, **1371**, for April–June 1950, **631**, for July–Sept. 1950, **871**, for Oct.–Dec. 1950, **1895**, for Jan.–March 1951, **2706**
Boelens, W. W., recording frequency-drift meter, **2484**
Böer, W., limiting the noise spectrum in oscillatory circuits, **2960**
Boers, C. J., detector circuits for f.m. receivers, **1479**
Boesch, W., 'operational analysis' and 'operational diagrams', **1575**
Bogdanova, N. B., and A. M. Lifshits, radio interference on 400-kV lines, **3102**
Boggis, A. G., with L. C. Burrill, electronic applications in naval-construction research, **(A)2249**
Bohm, D., and D. Pines, 'collective' description of electron interactions, **2975**
Bohnert, J. I., measurements on elliptical-polarization aerials, **2349**
Boissinot, G., with J. Ortusi, slotted waveguides as aerials, **815**
Bol, K., determination of speed of e.m. waves by resonant-cavity method, **430**
Bolinder, F., approximate theory of directional couplers, **2099**; Fourier transforms in theory of inhomogeneous transmission lines, **562**, **2909**
Bolljahn, J. T., electrically small aerials and l.f.-airborne-aerial problems, **(A)2642**
Bolt, F. D., ice formation on aerials, **818**; temporary television aerial at London station, **1076**
Bolt, R. H., and P. E. Doak, short-period transient response of auditoria, **(A)546**
—— with others, sound transmission through single and double walls, **(A)1811**
Bolton, J. G., and K. C. Westfold, galactic radiation, at 40–160 Mc/s, **866**, at 100 Mc/s, **348**
Bolton, T. S., with R. J. L. Butterer, automotive electronic test equipment, **(A)2245**
Bomke, H. A., and T. Schmidt, ponderomotive effects of cm waves, **681**
Bond, F. E., properties of wide-band phase-splitting networks, **(D)2123**
Bond, W. L., making small spheres, **3030**
—— W. P. Mason and H. J. McSkimin, coupling coefficients of single-crystal BaTiO$_3$, **2450**
Bonifas, H., determination of point representing saturation of diode, **3172**
Booker, H. G., Martyn's theory of magnetic storms and aurorae, **(A)2712**
—— and W. E. Gordon, theory of radio scattering in troposphere, **727**
—— J. A. Ratcliffe and D. H. Shinn, diffraction by irregular screen and ionospheric reflection, **428**
Booth, A. D., electronic digital computer, **1184**
—— and J. Ringrose, flip-flop circuit with three stable states, **2367**, **(D)2937**
Booth, C. F., evolution of frequency control, **1271**
—— with P. Vigoureux, Quartz Vibrators and their Applications, **(B)2464**
Boothroyd, W. P., and H. J. Churchill, microwave relay system, **215**
—— and E. M. Creamer, Jr, time-division multiplex system, **214**
Borden, R. C., C. C. Trout and E. C. Williams, 100-channel distance-measuring equipment, **2722**
Borgnis, F., general properties of electronoptical image, **87**; space charge and phase focusing of electron beams, **(D)3187**; transmission-line equations and cylindrical lines, **2639**
Borodovskaya, L. N., and A. E. Salomonovich, measurement of oscillation amplitude of quartz crystals, **2774**
Borovitski, S. I., fluctuations in linear system with periodically varying parameters, **2373**
v. Borries, B., electron scattering and image formation in electron microscope, **966**
Borzyak, P. G., photoconductivity of Cs-Sb films, **2723**
Bose, H. N., luminescence spectra of phosphors under X-ray and c.r. irradiation, **366**
Bosson, G., F. Gutmann and L. M. Simmons, resistance/temperature relation for thermistors, **1083**
Bosworth, R. C. L., adsorption of O$_2$ on W, **1937**
Bothwell, F. E., Nyquist diagrams and Routh-Hurwitz stability criterion, **580**; stability of voltage regulators, **(A)1251**; transients in multiply periodic nonlinear systems, **[illegible]**
Bott, R., and R. J. Duffin, impedance synthesis without use of transformers, **1108**
Botwin, L., simulator and design of automatic control systems, **(A)[illegible]**
Boucke, H., a.c. rectifier-type meter with reduced waveform error, **687**; audion valve voltmeter, **1968**; distortion meter, **688**
—— and H. Lennartz, electronic switches, **2935**
—— and O. Schmidt, amplifiers with selective feedback, **1124**
Boulding, R. S. H., with H. E. Penrose, Principles and Practice of Radar, **(B)3011**
Bouma, B. C., with W. C. van Geel, frequency variation of dynamic characteristic of system Al-Al$_2$O$_3$-electrolyte, **2286**
Bounds, A. M., and T. H. Briggs, Ni alloys for oxide-coated cathodes, **3033**
Bouthillon, L., centenary of birth of Oliver Heaviside, **1041**
Boutry, G. A., and J. L. Delcroix, space charge in planar magnetron under cut-off conditions, **2599**
—— with J. L. Delcroix, space charge in cylindrical magnetron under cut-off conditions, **2600**
Bouwkamp, C. J., Bethe's theory of diffraction by small holes, **1874**; characteristic values of spheroidal wave functions, **332**; diffraction of e.m. waves by disks and holes, **2160**; Sommerfeld's surface wave, **429**
Bowe, P. W. A., waveforms of atmospherics and very-low-frequency propagation, **1760**
Bowen, A. E., and W. W. Mumford, Type-1553 triode as modulator and amplifier, **319**
Bowen, E. G., radar observations of rain, and mechanism of rain formation, **1648**; recent work of Radiophysics Division, C.S.I.R.O., **2421**
Bowen, J. H., and T. E. Burnup, analogue computer for Fourier analysis and synthesis, **1696**
Bowen, W. A., Jr, with others, evidence for ionosphere currents from rocket experiments, **2713**
Boxma, I., mathematical bases of electronic computers, **1182**
Boyd, J. E., with C. F. Kent, probability distributions of resultants of two or more vibrations, **(A)678**
—— with V. R. Widerquist, low-level atmospheric conditions and over-water microwave interference patterns, **(A)2799**
Boyd, M. R., with L. Malter, grid current and grid emission in thyratrons, **2873**
Boyer, G. L., with others, experimental determination of acoustic wave fronts, **(A)517**, **1547**
Boyer, R. A., ultrasonic velocities in gases at low pressures, **1823**
Boyle, R. J., engineering aspects of Australian National Broadcasting Service, **1248**
Bracewell, R. N., and others, ionospheric propagation of low- and very-low-frequency waves, **2522**
Brackmann, J., with M. Kornetzki, cores for u.s.w. variometers, **1677**
Bradburd, E. M., magnetostrictive delay line, **2107**
Bradbury, R. A., with R. W. Caywood, s.w.r. bridge for 1·5–42 Mc/s, **948**
Bradfield, G., Rome ultrasonics convention, **10**
Bradley, W. E., electric network models for problems of probability, **(A)[illegible]**
Bradshaw, E., rationalized M.K.S. units in engineering education, **322**
Bradshaw, S. R., and W. Wathen-Dunn, square-wave testing of disk recording systems, **(A)551**
Brailsford, H. D., code transmitting radiosonde, **2243**
Braithwaite, J. G. N., infrared photoconductivity of valence intermetallic compounds, **2042**
Bramley, E. N., diversity effects in spaced-aerial reception of ionospheric waves, **1232**
—— and W. Ross, measurements of direction of arrival of short radio waves, **3091**
—— with others, direction of arrival of ionospheric waves, **2804**
Bramley, F. A., complex-tone generator for deviation tests, **1726**
Brasse, C., Jr, and R. Thomas, horizontal-polarization omnidirectional aerial, **2920**
Brattain, W. H., and G. L. Pearson, conductivity changes induced in Ge by α-particle bombardment, **1162**
Braumann, H., reaction of medium and acoustic radiation damping for disk, **4**
Braunbek, W., resistance variation of Pt foil due to gas adsorption, **125**
Braunewell, W., and E. Vogt, reversal of sign of magnetostriction by expansion, **916**
Braunschweiger, P. G., with others, frequency meter for microwave spectroscopy, **1723**
Bray, P. R., phase constant of transmission line, **1710**
Bray, W. J., radio valves for frequencies above 3 kMc/s, **1520**
Brasma, N. A., e.m. propagation in multi-wire system, **2332**
Bredow, H., u.s.w. broadcasting in Germany, **2838**
Bregar, J. C., abac for minimum-loss matching pads, **1587**
Bregman, A., Sb plate, **1950**
Bremmer, H., discharge of series of capacitors, **2970**; W. K. B. approximation as first term of series, **3088**
—— with B. van der Pol, Operational Calculus, based on the Two-sided Laplace Integral, **(B)1700**
Bressi, A., and G. G. Sacerdote, recording of nonlinear distortion, **1834**
Brewer, G. R., with others, single-cavity resonator for multi-anode magnetron, **(A)2304**
Brewer, R., radio-valve life testing, **2773**
Breyer, B., and F. Gutmann, processes in dielectrics containing free charges, **1875**
Bridgewater, T. H., studio and outside-broadcasting television practice in Great Britain, **471**, **752**; radio and cable links for B.B.C. television outside broadcasts, **2552**
Bridgman, P. W., effect of pressure on resistance of semiconductors, **2439**
Brière, M., A. Rogozinski and J. Weill, logarithmic amplification of weak currents using diodes, **2228**
Briggs, B. H., ionospheric investigation by rapid-frequency-change equipment, **1900**
—— and G. J. Phillips, horizontal irregularities of ionosphere, **980**
Briggs, T. H., with A. M. Bounds, Ni alloys for oxide-coated cathodes, **3033**
Bright, A. W., Corona and Breakdown at Frequencies up to 12 Mc/s, B.E.A.I.R.A. Technical Report L/T229, **(B) 1624**
Bright, W., influence of electrodes on discharge between coaxial cylinders, **[illegible]**
Bril, A., and F. A. Kröger, fluorescence saturation in television c.r. tubes, **1923**
Brillouin, L., information and entropy, **2009**, **2010**
Brimberg, S., effect of losses on attenuation of 4-terminal impedance networks, **1110**
Broc, J., radar echoes from cloudless region, **2711**
Brochard, J., and others, evaporation in vacuo by direct bombardment, **3029**
Brockner, C. E., angular jitter in automatic-tracking radar systems, **1389**
Broer, L. J. F., propagation of energy in linear conservative waves, **1621**
de Broglie, L., propagation of waves of frequency 0·3–10 kMc/s, **435**
Brooks, F. E., Jr, receiver for measuring angle of arrival, **2523**
Broomall, J., and L. Riebman, sampling analogue computer, **(A)2220**
Broser, I., and R. Warminsky, dependence of electrical properties of CdS on electrode arrangement, **1929**
Brossart, J., with others, travelling-wave valves with magnetic field, **1020**
Brown, C. S., and others, growth of large quartz crystals, **3024**
Brown, E. B., polar ammeter as a.c. potentiometer, **162**
Brown, G. M., with W. J. G. Beynon, geophysical and meteorological changes, Jan.–April 1949, **2999**
Brown, J., effect of periodic variation in field distribution across radiating aperture, **573**
—— and S. S. D. Jones, microwave lenses, **36**, **(D)2924**
Brown, R. E., with L. P. Hunter, test equipment for transistors, **398**
Brown, R. F., with others, comparison of sound pressures in earphone couplers and in ear, **(A)1811**
Brown, R. H., and C. Hazard, r.f. radiation from Andromeda nebula, **629**
Brown, S. C., with others, effect of magnetic field on breakdown of gases at u.h.f., **1184**
Brown, T. T., mixer harmonic chart, **2366**
Brown, W. F., Jr, dielectric constants of nonpolar fluids, **609**, **669**
Browne, I. C., radar echo from lightning, **1657**
Browne, S. H., with J. J. Gilvarry, application of Liouville's approximation to blind navigation, **900**
Brubaker, W. M., potential distributions in parallel plane diodes, **3171**
Bruce, F. M., review of spark discharge phenomena, **2402**
Brückmann, D., W. S. Carey and D. J. Fuller, comparison of triodes and beam tetrodes as output valves in a.f. amplifiers, **1123**, **(D)2959**
Bruckmann, H., anti-fade transmitting aerial, **2644**
Bruges, W. E., algebra for solution of ladder networks, **1588**
Bruma, M., null method for determining dielectric constant at u.h.f., **1429**, **1430**
—— with M. Magat, resonator for m and dm λ, **2954**
Bryant, J. H., Type-5929 10-W travelling-wave valve, **1519**
Bubb, F. W., Jr, network theorem, **2864**
Bube, R. H., luminescence and trapping in ZnS phosphors, **649**; ZnS-Cu phosphors, effect of infrared on emission and trapping in, **648**, variation of photoluminescence efficiency with temperature, **1664**
Buckingham, M. J., surface photoelectric effect, **607**
Buckley, E. F., with others, multichannel p.a.m.-f.m. radio telemetering system, **1443**
Buckley, S. E., with others, properties and tests of magnetic powders, **1948**
Budarov, A. E., and L. E. Leykhter, theory and design of reflex voltmeter, **2767**
Budde, W., fluctuations of angle of departure of ionospheric waves, **1996**
Budden, K. G., propagation of radio atmospherics, **1658**
—— with others, ionospheric propagation of low- and very-low-frequency waves, **2522**
Buehler, E., with others, growth of Ge single crystals containing *p-n* junctions, **1662**
Bull, C. S., space-charge smoothing factor, **2058**, **(D)2671**
Bullard, E. C., origin of earth's magnetic field, **350**
Bullington, K., coverage on 45–450 Mc/s, **3096**; u.h.f. propagation beyond horizon, **436**
Burd, A. C., and A. J. Lee, sonic scattering layers in sea, **2068**
Burdun, G. D., microwave measurements of permittivity and loss of solid dielectrics, **[illegible]**
Bureau, R., and M. Barré, radiogoniometer measurements of atmospherics in *Commandant Charcot*, **687**
—— and A. Dauvillier, chromospheric flare of 19th Nov. 1949 and geophysical effects, **1143**
Burger, J. A. N., with A. M. van Wijk, secular variation of magnetic elements in South Africa, 1939–1948, **1373**
Burgess, R. E., capacitance of Se rectifiers, **(D)1250**; effect of D layer on very-low-frequency waves, **(D)724**; rectification and observations of signals in presence of noise, **3098**
Burgett, M. I., with E. M. Creamer, Jr, carrier synchronizing circuits for colour-television receivers, **(A) 2292**
Burgmann, V. D., and K. V. Sheridan, microwave d.f. for aircraft navigation, **2189**
Burkard, O., *F* radiation of sun, **2985**; ionosphere, disturbance 15th March 1948, **889**, observations in arctic region, **1378**, thermal splitting in, **879**
Burkhard, H. F., facsimile transmission speed, **236**
Burkhardtsmaier, W., h.f. generators and applications, **2496**; transmitters for u.s.w. f.m. broadcasting, **2858**
—— and U. Finkbein, circularly grouped aerials as omnidirectional and unidirectional radiators, **568**
Burnap, R. S., with others, Television, Vols, 5 & 6, **(B)2038**
Burnett, J. H., thyratron grid-circuit design, **1963**
Burnup, T. E., with J. H. Bowen, analogue computer for Fourier analysis and synthesis, **1696**
Burr, R. P., W. R. Stone and R. O. Noyer, test-pattern generator for colour-television signals, **(A)2292**
Burrell, C. M., T. G. Majury and H. W. Melville, dielectric-constant method of observing polymerization, **2240**
Burrill, L. C., and A. G. Boggis, electronic applications in naval-construction research, **(A)2249**
Burroughes, E. R., planning v.h.f. mobile systems, **(D)987**
Busby, J. W., Model TB-140 'ramark' radar beacon, **1916**
Busch, G., electronic conduction in non-metals, **1665**
—— J. Wieland and H. Zoller, electrical properties of grey tin, **2438**
Bush, J., stabilized variable-frequency transmitter exciter for military h.f. equipment, **(A)2298**
Bussey, H. E., reflected-ray suppression, **1244**, **(A)2799**
Butcher, F. E., with R. Willheim, magnetic amplifier technique, **(A)2122**
Butler, E. W., orienting engineers in industry, **(A)2308**
Butler, O. I., and H. R. Chablani, h.f. magnetization of ferromagnetic laminae, **1684**
Butterer, R. J. L., and T. S. Bolton, autmotive electronic test equipment, **(A)2245**
Butts, R. S., electronic commutation methods, **(A)2270**
Byloff, R. W., television studio audio console, **3112**

C

de Cadenet, M. J., comparison of cinematography and television techniques. **1007**
Cady, W. G., piezoelectric equations of state and thickness-vibration transducers, **99**
—— with others, capacitance bridge for h.f., **1717**
Caffiaux, J., with others, semi-automatic manufacture of audio and video equipment, **(A)2292**
Calderwood, J. H., R. Cooper and H. K. Heppel, dielectric properties of Cu$_2$O rectifiers, **925**
Callendar, M. V., influence of high-order products on nonlinear distortion, **(D)2893**
—— and S. Matthews, harmonics and intermodulation frequencies in nonlinear amplifiers and mixers, **2956**
Campbell, C. F., design of equalizers by synthesis technique, **1591**
Campbell, D. A., with others, measurement of polarization of l.f. ionosphere reflections, **(A)2799**
Cannon, W. W., with others, beam analyser, **(A)2226**
Capodanno, R. T., with K. James, permanent-magnet focusing for picture tubes, **[illegible]**
Carbenay, F., statistical action of atmospherics on receiver tuned to 27 kc/s, **1651**
Carey, W. S., with others, comparison of triodes and beam tetrodes as output valves in a.f. amplifiers, **1123**, **(D)2959**
Carlevaro, M., variation of resonance frequency in gyro-interaction, **197**
Carlson, G., 200-kV neutron generator, **2251**
—— with I. Bartholdson, 200-kV neutron generator, **2252**
Carome, E. F., and H. C. Nash, selective relay amplifier for recording WWV time signals, **74**
Carr, E. F., with others, effect of radiation on *Q* of unshielded parallel-wire transmission line, **(A)2100**
Carr, L. H. A., M.K.S. or Giorgi system of units, **323**
Carruthers, J. A., with others, diffraction errors in optical investigation of aerial pattern, **2110**
Carruthers, R., with others, design of electron synchrotrons, **1212**
Carter, A. H., and A. O. Williams, Jr, expansion for velocity potential of piston sources, **(A)521**, **1815**
Carter, P. S., l.f. aerials, **(A)2642**
Cartwright, M. L., forced oscillations in nonlinear systems, **1417**
Casimir, H. B. G., theory of e.m. waves in resonant cavities, **2953**
Caspari, M. E., and W. J. Merz, electromechanical effects in BaTiO$_3$ single-domain crystals, **918**
Castaing, R., measurement of elliptical astigmatism of electron lenses **701**, **702**
Castell, V., picture telegraphy by wire, **3123**
Castellani, A. V., television standardization in Italy, and new synchronization generator, **470**
Castellis, L., and F. Halla, ferromagnetic interactions in Mn alloys, **915**
Caussin, C., with R. David, ignitron and applications, **1015**
Cawood, D. A., calculations for class-C amplifiers with reactive load, **(A)[illegible]**
Cawthra, W. A., and W. E. Thomson, bandwidth of sinusoidal carrier wave modulated in frequency by rectangular wave, **1942**
Caywood, R. W., and R. A. Bradbury, s.w.r. bridge for 1·5–42 Mc/s, **948**
Caywood, W., Jr, breakdown of air at r.f., **(A)2194**
Cazalas, A., conversion of television standards, **2845**
Cazenave, R., with P. M. Prache, cylindrical-coil theory and calculation of reluctance, **2658**; measurement of permeability and magnetic losses of straight samples, **156**
Chablani, H. R., with O. I. Butler, h.f. magnetization of ferromagnetic laminae, **1684**
Chadburn, C. G., with others, piston attenuator for cable testing at 1–30 Mc/s, **1708**
Chaffee, E. L., with Chai Yeh, h.f. impedance of low-pressure gaseous diodes, **776**
Chai Yeh. See Yeh Chai.
Chait, H. N., microwave radar aerial, **1850**; microwave Schmidt system, **(A)2100**
Chakrabarty, I. L., and S. D. Chatterjee, influence of solar activity on cosmic-ray intensity, **1362**
Chakrabarty, S. K., geomagnetic 'sudden commencements' at Alibag, **1378**
Chalhoub, C., anode-load compensation network, **304**
Challansonnet, J., with others, effect of radioactivity on thermoelectronic emission, **2301**; radioactive elements in study of oxide cathodes, **[illegible]**
Chalmers, J. A., origin of electric charge on rain, **2429**
Champeix, R., ionization pump, **1895**; optical pyrometry of oxide cathodes, **1525**; transformation of heat into electrical energy in thermionic phenomena, **2586**
—— with J. Debiesse, photoelectric effect in oxide cathodes, **1087**
Champion, K. S. W., production of pulsed magnetic fields, **[illegible]**
Chandrasekhara, B. S., with others, simple voltage stabilizer for G-M counters, **228**
Chang, Sze-Hou, G. E. Pihl and M. W. Essigmann, statistical properties of speech sounds, **(A)540**, **1827**
Chantereau, J., R. Musson-Genon and R. Métivier, 3-cm l.v. reflex klystron RHK 6332, **2069**
—— with others, test methods and apparatus for 3-cm l.v. klystrons, **683**
Chapman, S., upper atmosphere, corpuscular effects in, **877**, nomenclature for, **876**, **1642**; notes on aurorae and magnetic storms, **1639**
Charp, S., Fourier-coefficient harmonic analyser, **144**
Charton, P. W., with A. M. Skellett, 30-element radial-beam switching tube, **1030**
Chasmar, R. P., and A. F. Gibson, long-period photoeffects in PbS, **3156**
Chatten, J., with others, flying-spot colour-signal generator, **(A)2298**
Chatterjee, S. D., with I. L. Chakrabarty, influence of solar activity on

cosmic-ray intensity, 1362
Chatterjee, S. K., electrical constants of sand at u.h.f., 2211
Chaux, R., and J. Dascotte, passive relays of Afourer/Bin-el-Ouidane link, 220
Chavance, P., with others, equipment for study of cm-wave propagation, 3115
Chavasse, P., application of means for assessing quality of telephone transmissions, 1486
—— and R. Lehmann, definition of complex noise with continuous spectrum, 799; ultrasonics in everyday life, 2886
Cheatham, T. P., Jr, with others, application of correlation analysis to reception of periodic signals in noise, 730
Cheek, R. C., problems of microwave links, (A)216
Cheney, M. G., Jr, and R. B. Watson, diffraction of e.m. waves by two parallel half-planes, 2414
Cheng, D. K., and R. A. Galbraith, stagger-tuned loop aerials with wide-band l.f. reception, (A)2100
Cheng, K. C., with H. S. Green, reciprocity theorem of electrodynamics, 2690
Chester, W., diffraction of sound pulse at open end of semi-infinite duct, 268
Chestnut, H., and R. W. Mayer, comparison of steady-state and transient performance of servomechanisms, 222
Cheston, T. C., approximate method for s.w.r. of microwave aerial array, 828
Chetaev, D. N., emission of sound by piston, 2312
Chevallier, A., propagation of h.f. wave along 3-phase line, 1299
Chiplonkar, M. W., and M. S. Hattiangadi, reflection of atmospherics from ionosphere, 2184, 2185
Chipman, R. A., E. F. Carr and N. A. Hoy, effect of radiation on Q of unshielded parallel-wire transmission line, (A)2100
Chisholm, J. P., E. F. Buckley and G. W. Farnell, multichannel p.a.m.-f.m. radio telemetering system, 1443
Chodorow, M., and S. P. Fan, f.m. high-efficiency klystron transmitter (A)2304
—— and others, design of 10^9-eV linear electron accelerator, (A)2245
Chrétien, L., Le Tube a Rayons Cathodiques, (B)2880
Christaldi, P. S., c.r.o. in a.m., f.m. and television broadcasting, (A)2226
—— with others, millimicrosecond oscillography, 3054
Christiansen, W. N., and J. V. Hindman, long-period change in solar radiation at dm λ, 2171
—— D. E. Yabsley and B. Y. Mills, solar radiation at 50 cm during eclipse, 346
—— and others, radio observations of two large solar disturbances, 2168
Christoffers, W. A., and R. P. Wellinger, properties of interfaces in metal/ceramic seals, (A)2194
Christopher, H. N., with others, quality rating of television images, 751
Chu, L. J., with others, biconical e.m. horns, (C)2345
Church, H. F., factors affecting life of impregnated-paper capacitors, 1586
Churchill, H. J., with W. P. Boothroyd, microwave relay system, 215
Chute, G. M., load sharing for welder ignitrons, 1739; photoelectric register controls, 2787
Clapp, C. W., detection of small metal objects in logs and iron ore, 1979
Clark, J. W., effect of intense microwave radiation on living organisms, 175
—— and R. E. Neuber, end-cooling of power-valve filaments, 1024
—— and others, crystal control of 4-kW 1036-Mc/s transmitter, (A)2298
—— with others, K-band amplifier klystron, (A)2304
Clark, S. C., Jr, with C. E. Feiker, longitudinal slots in circular waveguides, 2105
Clarke, R., air navigational aids, 3005
Claussnitzer, W., and H. Heumann, plotting of electric fields, using semi-conducting paper, 1427
Clavier, A. G., with others, travelling-wave-valve amplifier, (A)2270
Clavier, P. A., active coaxial tube, 1019
Clayton, H. R., and R. S. Young, ultrasonic lamination-flaw-detection equipment, 3072
Cleary, E. P., with others, microwave study of high-pressure arc, 1132
Clegg, J. A., with others, radio echo equipment for determination of meteor radiants, 3003
Clemens, J. F., coaxial feed system for aerials, 288
Clemmow, P. C., diffraction of cylindrical wave by perfectly conducting half-plane, 1130; exact solution of a class of two-dimensional diffraction problems, 1620
Clogston, A. M., reduction of skin-effect losses by use of laminated conductors, 2908
Clutts, C. E., TD-2 radio relay system New York/Chicago, 450
Cobine, J. D., and D. A. Wilbur, electronic torch and related h.f. phenomèna 2785
—— E. P. Cleary and W. C. Gray, microwave study of high-pressure arc, 1132
Cochrane, C. A., phase-front plotter for microwave aerials, 2486
Cocking, W. T., aerial feeder connection by balance-to-unbalance transformer, 825; flyback h.v., 488; Wireless Servicing Manual, [illegible]
Cockroft, A. L., and S. C. Curran, elimination of end effects in counters, 1989
—— and J. M. Valentine, proportional counters and ion chambers with external graphite electrodes, 709
Cohen, E., and A. Easton, field-sequential colour companion, 2844
Cohen, R. M., 6BQ7 twin triode in television tuners, 2033
Cohen, R. S., L. Spitzer, Jr, and P. M. Routley, electrical conductivity of ionized gas, 335
Cohn, S. B., constants of metallic delay media containing obstacles, 2351
—— with K. Tomiyasu, directional coupler permitting full power transfer, (A)2100
Collet, L. J., definition and characteristics of superposed circuits, 592; representation of network by superposed balanced circuits, 2671
Collett, H. O., development of broadcasting in South Africa, 3118
Collinge, B., hydrogen-filled G-M counters, 186
Collins, A. E., and D. G. Kiely, microwave-aerial radiation patterns, 1077
—— with others, cheese aerials for marine navigational radar, 1080
Colombani, A., induction heating of hollow metal sphere, 2244; optimum dimensions of helical stranded-wire receiving aerial, 1578; self inductance of solid sphere and mutual inductance with endless solenoid, 388
—— and G. Ranc, crystallization of thin gold films, 2739
Colombo, S., general scheme relating to problem in cybernetics, 2022; symbolic calculus in mathematical research, 930
Combridge, J. H., and J. O. Ackroyd, upper limit of frequency for human hearing, (D)2322
Cone, F. E., and N. P. Kellaway, test and alignment procedures for video amplifiers, 1201
Comes, H. N., effect of metal mast and guy wires on performance of 600-Ω multiple-wire delta aerial, 1567
Conn, G. K. T., and B. Donovan, measurement of strong magnetic fields with Bi spirals, 1431
—— with B. Donovan, anomalies in magnetoresistance of Bi fibres, 373
Connelly, F. C., Transformers, (B)1337
Connolly, J. J., dependable small-scale digital computer, (A)2220
Connolly, T. J., S. P. Frankel and B. H. Sage, predicting phase behaviour with digital computers, (A)1749
Connor, R. D., properties of spark counters of Rosenblum type, 1461
Convert, G., with R. Berterottière, effects of space charge in travelling-wave valves, 262
Cook, A. C., L. K. Kirchmayer and C. N. Weygandt, special devices for differential analysers, (A)1183
Cook, K. H., and R. G. Artman, u.h.f. television propagation measurements, 2563
Cook, R. K., and S. Edelman, correlation coefficients as criteria for randomness of sound fields, (A)547
—— and P. G. Weissler, piezoelectric constants of α- and β-quartz at various temperatures, 450
—— with others, American Standard Z24.4–1949, pressure calibration of laboratory-standard microphones, 19; American Standard Z24.9–1949, coupler calibration of earphones, 21
Cooke, S. P., with E. W. Fletcher, stabilization of microwave oscillator with NH_3 absorption line, (A)1958
Cooke-Yarborough, E. H., and E. W. Pulsford, counting-rate meter, of high accuracy, 2258, logarithmic, covering wide range, 2256
Coomes, E. A., with others, Schottky effect for polished Ta, 1981
Cooper, B. F., telemetering raindrop size distribution, 3001
Cooper, R., capacitance measurements on Se rectifiers showing anomalous dispersion, 744
—— with others, dielectric properties of Cu_2O rectifiers, 985
Cooper, V. J., shunt-regulated amplifiers, 2562
Cooperstein, M., with others, rotating-beam method for investigating electron lenses, (A)2245
Copeland, P. L., and D. N. Eggenberger, field at cathode as function of space current, 506
Copson, A. P., 'distributed' power amplifier, 314
Corbett, J. P., electrical analogues of linear systems, 58
Corbyn, D. B., influence of high-order products on nonlinear distortion, (D)2894
Corcoran, G. F., with R. M. Kerchner, Alternating Current Circuits, (B)2388
Cordero, F., with V. H. Dibeler, diaphragm-type micromanometer, 1438
Corke, R. L., with C. F. Floyd, measurement of electrical characteristics of piezoelectric resonators, 1704
Corkum, R. W., isotropic artificial dielectric, (A)2100
Corliss, E. L. R., and W. F. Snyder, calibration of audiometers, 1054
—— R. F. Brown and K. T. Lemmon, comparison of sound pressures in earphone couplers and in ear, (A)1811
Corner, W. D., with R. S. Tebble, reversible susceptibility of ferromagnetic materials, 1168
Corrington, M. S., amplitude and phase measurements on loudspeaker cones, (A)2062; locked-in oscillator for television-sound reception, 2034; transient testing of loudspeakers, 277
Costa de Beauregard, O. See de Beauregard, O. Costa.
Cotte, M., effect of connectors on properties of cable, 2634
Coulson, N., thermocouple millivoltmeter for r.f., 161
Court, P. R. J., new line-scanning circuit, 489
Covington, A. E., microwave sky noise, 1367
Cowhig, W. T., with P. C. Thonemann, self magnetic field in gas discharges, 2146
Cox, H. L., with others, frequency meter for microwave spectroscopy, 1723
Cox, J. R., W. M. Ihde and A. P. G. Peterson, apparatus for acoustic impedance measurement, (A)534
Coyne Electrical and Radio-Television School, Practical Television Servicing and Trouble-shooting Manual, (B)762
Craggs, J. D., and J. M. Meek, recent research on spark discharges, 1344
—— with H. M. Gaunt, electrical and optical characteristics of d.c. corona discharge, 2145
—— with others, scattering of 3-cm radiation by ionized gases, 96
Craib, J. F., improved pulse stretcher, 2855
Craig, J. A., coaxial-stub filter, 2635
Crane, G. R., J. G. Frayne and E. W. Templin, professional magnetic-recording system for films, 2629
Crawford, A. B., and W. C. Jakes, Jr, selective fading of microwaves, (A)2263
Crawford, A. E., methods of generating ultrasonic energy, 1291
Crawley, J. B., wide-band amplifier for central-aerial installations, 1601
Creamer, E. M., Jr, and M. I. Burgett, carrier synchronizing circuits for colour-television receivers, (A)2292
—— with W. P. Boothroyd, time-division multiplex system, 214
Cremer, L., Die wissenschaftlichen Grundlagen der Raumakustik, Vol. 3, [illegible]
Crittenden, E. C., Jr, with S. L. Fawcett, ejection of electron beam from betatron, 961
Crompton, J. W., impedance/frequency characteristics of slot aerials, (D)574
Croney, J., simple logarithmic receiver, 3096
Crosby, D. R., linear network neighbourhood equivalence, (A)2122
Crosby, E. L., Jr, and K. F. Umpleby, h.f. amplifiers with direct coupling, (A)2122
Crosby, H. M., 5-kW klystron u.h.f. televison transmitter, 2849
Crosswhite, H. M., D. W. Steinhaus and G. H. Dieke, suppression of parts of spark spectra, 3076
Crothers, M. H., π-coupled RC feedback oscillator, 309
Crow, D. A., with others, piston attenuator for cable testing at 1–30 Mc/s, 1709
Crowhurst, N. H., design of input (regulation) choke, 2659; design of iron-cored inductors carrying d.c., 1096
Cuccia, C. L., multibeam electron coupler, (A)2304
Cudworth, A. L., with others, calculation and measurement of loudness, (A)542, [illegible]
Cullen, A. L., absolute measurement of microwave power, 2771
—— with H. M. Barlow, Micro-Wave Measurements, (B)1203
—— with H. Marriott, rationalization of electrical theory and units, 322
Cullum, A. E., Jr, performance of directional aerials, 2653
Culshaw, W., Michelson interferometer for mm wavelengths, 950
Cumeralto, Q. G., broadcast station construction practices, 3114
Cunliffe, A., and L. E. S. Mathias, perturbation effects in cavity resonators, 70
Cunningham, W. J., growth of subharmonic oscillations, 2627
—— J. C. May and J. G. Skalnik, integration-noise reducer for radar, 360
Curie, D., with F. Vigean, quenching action of long-wave radiation in electrophotoluminescence, 1608
Curran, S. C., with A. L. Cockroft, elimination of end effects in counters, 1989
Currie, A. A., general-purpose analogue computer, 1953
Cutler, C. C., and C. F. Quate, space-charge and transit-time reduction of noise in electron beams, 1274
Cutolo, M., self-interaction of radio waves in ionosphere, 1758
Cutrona, L. J., theory of biconjugate networks, 2939
Czerny, M., W. Kofink and W. Lippert, bolometer with short time-lag, [illegible]

D

Dain, J., with others, design and operation of 30-MeV synchrotron, 1213
Damianovitch, A., life and work of Tesla, 2606
Dammers, B. G., and J. Otte, interelectrode feedback in frequency changers, 1482
—— P. D. van der Knaap and A. G. W. Uitjens, electrical recording of diagrams, 3075
Danforth, W. E., elements of thermionics, 2571; thoria as cathode emitter, 3169
Daniel, E. D., and P. E. Axon, accidental printing in magnetic-tape recording, 819
Daniel, V., and K. H. Stark, dielectric properties of ketones, 1941
Daniels, F. B., propagation of sound waves in cylindrical conduit, 2
Daniels, J. M., 100-kW water-cooled solenoid, 1097
Danko, S. F., and S. J. Lanzalotti, assembly of miniature military equipment, [illegible]
Dänzer, H., theory of shot and Johnson effects, 2135
Danzin, A., titanate ceramic dielectrics with high permittivity, 132
Darbyshire, J. A., modulated light source, 2867
Darlington, S., potential-analogue method of network synthesis, 2370
Darner, C. L., with W. J. Trott, properties of sound-absorbent panels at high hydrostatic pressures, (A)545
Darrow, K. K., nuclear and electronic magnetic resonance, 2965
Das, P. M., with S. R. Khastgir, periodic fading of s.w. signals, 961
Dascotte, J., with R. Chaux, passive relays of Afourer/Bin-el-Ouidane link, 220
Daudin, A., and J. Daudin, temperature effect in counters and radio valves, 3064
Daudin, J., with A. Daudin, temperature effect in counters and radio valves, 3064
Dauvillier, A., variations and origin of cosmic radiation, 2991
—— with R. Bureau, chromospheric flare of 19th Nov. 1949 and geophysical effects, 1143
Davey, F. G. G., ladder filter and a.f. and r.f. applications, 1113
David, R., and C. Caussin, ignitron and applications, 1015
Davids, H. H., and T. J. Foster, crowded-band mobile equipment, 3117
Davidson, D., ionospheric reflection of h.f. waves during aurora, 1649
Davies, D. E., with F. L. Jones, cathode surface layers and minimum sparking potential, 2973
Davies, I. L., with P. M. Woodward, theory of radar information. 395
Davis, H., with others, performance of audiometers, 1053
Davis, L., Jr, strength of interstellar magnetic fields, 1891
Davis, N. L., and R. E. White, fast sweep circuit, 404
Dawson, R. W., with A. C. Beck, conductivity measurements at 9 kMc/s, 384
Dawton, D. I., with others, cosmic-ray intensity and radio fade-outs, 1763
Daymond, S. D., resistance of rectangular metal plate with internal electrode, 2142
Debiesse, J., radioactive elements for study of oxide cathodes, 505
—— and R. Champeix, photoelectric effect in oxide cathodes, 1027
—— J. Challansonnet and G. Neyret, radioactive elements for study of oxide cathodes, 1522
—— and others, effect of radioactivity on thermoelectronic emission, 2301
Dedrick, J. H., with H. A. DeVincentis, recrystallization and grain growth in tungsten wire, 1411
Dekker, A. J., and W. C. van Geel, rectifier properties of system Al_2-Al_2O_3-electrolyte, 1254
—— with W. C. van Geel, a.c. electrolytic capacitors, 1100
—— with W. F. Leverton, Hall coefficient and resistivity of evaporated Bi films, 1403
—— with A. H. Morrish, decay of luminescence of KBr and LiF, 904
Delange, H., Tchebycheff polynomials, 187
DeLange, O. E., propagation at microwave frequencies, (A)2263
Delbord, Y. L., television, film recording of transmissions, 254, and transmission of information, 2028
Delcambe, J., with É. Divoire, calculation of radiation from u.s.w. aerials, 2109
Delcroix, J. L., magnetron in cut-off state, 3185
—— and G. A. Boutry, space-charge in cylindrical magnetron under cut-off conditions, 2600
—— with G. A. Boutry, space-charge in planar magnetron under cut-off conditions, 2599
Del Grosso, V. A., with A. Weissler, velocity of sound in sea water, (A)514, 1814
Delobeau, F., E. Harnischmacher and F. Oboril, ionospheric observations at Dakar, 1148
Delvaux, J. L., transmission standards in television, 468
Denis, M., distortion of f.m. signals by long feeder lines, 43
Denisse, J. F., J. L. Steinberg and S. Zisler, correlation of geomagnetic and solar activity, 2983
—— with É. J. Blum, solar r.f. radiation on 156 and 164 Mc/s, 627
—— with others, interpretation of solar-noise jumps, 1359; low-intensity solar radio storms, 1358
Denno, S. N., H. A. Prime and J. D. Craggs, scattering of 3-cm radiation by ionized gases, 96
Derr, W., T. C. Wren and J. V. Kresser, power-line carrier system for multistation control etc., 425
Deschamps, G. A., representation of polarization of e.m. wave, 2418
Dessens, H., and C. Fert, spider-thread grids for electron microscopy, 1452
Destriau, G., and J. Mattler, effect of temperature on electrophotoluminescence phenomena, 644
DeTar, D. R., and H. T. Lyman, Jr, variable-inductance television tuner for v.h.f. channels, 1269
DeVincentis, H. A., and J. H. Dedrick, recrystallization and grain growth in tungsten wire, 1411
Dewan, J. T., and K. W. Allen, recorder for μs-pulse amplitudes, 402
Dewey, G. C., P. Parzen and T. J. Marchese, periodic-waveguide travelling-wave amplifier for medium powers, 2047
Diamond, J. M., maximum output from resistance-coupled triode amplifier, 2393
Dibeler, V. H., and F. Cordero, diaphragm-type micromanometer, 1438
Dickey, E. T., with others, Television, Vols. 5 & 6, (B)2038
Dickey, J., photoelectric emission from Na and K, 1668
Dickey, J. E., and E. A. Taft, photoelectric changes in SrO and BaO due to ultraviolet irradiation, 365
Dickinson, C. J., h.v. for c.r.o. from r.f. oscillator, 1785; simple slow-running timebase, 1121
Dickson, D. V., solution of spherical-triangle problems in radio, 2754
Dieke, G. H., with others, suppression of parts of spark spectra, 3076
Diemer, G., microwave diode conductance, 3178; passive feedback admittance of disk-seal triodes, 2593
—— and J. L. H. Jonker, time delay of secondary electron emission, 1014
—— and K. S. Knol, low-level triode amplifier for microwaves, 780
—— with K. S. Knol, e.m. waves in waveguides, 565; fluctuations and damping in double-cathode valves, 507, (C)3175
Dieminger, W., scattering of radio waves, 1762
—— and K. H. Geisweid, solar and terrestrial phenomena during sudden ionospheric disturbance 19th Nov. 1949, 885
Dighton, D. T. R., balance indicator using cathode follower, 2513
Dil, W. F., principles of measurement of coupled circuits, 393, (C)939
Dillenburger, W., linearization of frequency response of wide-band amplifiers, 1871
Dilley, J. E., with others, portable television pickup equipment, (A)2292; storage oscilloscope, 3055
Dimock, P. V., with others, 6-channel mobile urban R/T system, 741
Dinsdale, A., frequency-interlace system of colour television, 1004
Distad, M. F., equilibrium currents induced in zinc blende by electron bombardment of negative electrode, 1140
Dite, W., with P. F. Panter, quantization distortion in p.c.m., 1488
Diven, L., with others, crosstalk considerations in time-division multiplex systems, 740
Divoire, É., and J. Delcambe, calculation of radiation from u.s.w. aerials, 2109
Dixey, K. H., and C. V. Wilman, increasing power rating of vibratory converters, 1783
Doak, P. E., with R. H. Bolt, short-period transient response of auditoria, (A)546
Dodd, S. H., H. Klemperer and P. Youtz, e.s. storage tube, 1684
Doehler, O., travelling-wave valves, 1017
—— J. Brossart and G. Mourier, travelling-wave valves with magnetic field, 1020
—— with R. Warnecke, travelling-wave valve with transverse electric and magnetic fields, 1276
—— with others, delay lines of comb or interdigital type, 772; electron beams and e.m. waves, 3166; space-charge effects in travelling-wave valves with magnetic field, 1022
Doherty, L. H., effect on propagation of atmospheric layer of nonstandard refractive index, (A)2263, (A)2799
Döhler, O. See Doehler, O.
Doizelet, H., amplifiers for slowly varying very low voltages, 1835
Dolbear, D. W. N., H. Elliot and D. I. Dawton, cosmic-ray intensity and radio fade-outs, 1763
Domb, C., statistics of correlated events, 933
Dome, R. B., colour television, frequency-interlace system, 466, spectrum utilization in, 3181
Donovan, B., and G. K. T. Conn, anomalies in magnetoresistance of Bi fibres, 373
—— with G. K. T. Conn, measurement of strong magnetic fields with Bi spirals, 1431
Doremus, J. A., telemetry system for radioactive snow-depth gauge, 1736
Dorff, L. A., U.S. highway mobile telephone system, 2279
Dorgelo, E. G., and P. Zijlstra, two transmitting valves for mobile installations, 2062
Dormont, H., electrolyte-tank determination of equipotentials of helicoidal conductors, 1196; thermodynamics of two-cathode system, 2870
Dornfeld, E. G., with J. H. Reisner, small electron microscope, 965
Dornhoefer, W. J., self-saturation in magnetic amplifiers, 880
Dörr, K., optimum junction points in networks, 2839
Dorrestein, R., energy-flow distribution in paraxial beams, 616; image formation in c.r. tubes, 500
van Dorsten, A. C., H. Nieuwdorp and A. Verhoeff, Philips 100-kV electron microscope, 1458
Douglas, A., Baldwin electronic organ, 1210
Douglas, R. W., and E. G. James, crystal diodes, 2587
Dow, W. G., with H. W. Welch, Jr, synchronous conditions in cylindrical magnetron space charge, 2601
Dreier, S. G., with S. G. Lankester, radio control for ship models, 1747
Dreyfus-Graf, J., phonetic steno-sonograph, 271
Driver, K. S., with F. V. Webster, h.f. permeability of ferromagnetic materials, 1167
Drost, R. Y., N.R.U. modulation monitor Type ON301, 1971
Drummond, D. G., The Practice of Electron Microscopy, (B)191
Dubin, C., and M. Magnien, study of meshed network, 1855
Duchesne, M., with A. Lallemand, properties of complex photoelectric layers, 1272
Duerden, F., with [illegible] Gupta, geometrical solution of transmission-line problems, [illegible]
Dufay, J., and M. Dufay, night-sky spectrum from 6 800 to 9 000 Å, [illegible]
Dufay, M., with J. Dufay, night-sky spectrum from 6 800 to 9 000 Å, [illegible]
Duffin, R. J., with R. Bott, impedance synthesis without use of transformers, 1106
Dufour, J., dm-wave propagation in Switzerland, 979

Dugas, C., with others, adsorption on semiconductors, **1667**
DuHamel, R. H., optimum current distributions for aerial arrays with circular symmetry, **(A)2100**
Duinker, S., with others, influence of initial phase in nonlinear circuits, **2673**
Dunbar, A. S., theory of aerial beam shaping, **(A)2100, (A)2642**
Dungey, J. W., dispersion equation for Alfvén's magnetohydrodynamic waves, **2979**
Dunlap, W. C., properties of high-resistivity *p*-type Ge, **660**
—— with R. N. Hall, preparation of *p-n* junctions by impurity diffusion, **378**
Dunn, A. L., A. R. McIntyre and A. L. Bennett, automatic beam blanker for c.r.o., **405**
Dunoyer, J. M., electrical properties of thin Ge layers, **3021**
Dunoyer, L., Le Vide et ses Applications, **(B)1413**
Dupouy, G., disturbance of geomagnetic field by electric railways, **1145**
Durand, É., potential and field of e.s. electron lens, **1456**
Duschek, A., and A. Hochrainer, Grundzüge der Tensorrechnung in analytischer Darstellung, Teil I, Tensoralgebra, **(B)388**
Dutilh, J. R., theory of relay servomechanisms, **748**
Dutton, G. F., gramophone turntable speeds, **2329**
van Duuren, H. C. A., teleprinter system using radio links, **2837**

E

Eaglesfield, C. C., life of valves with oxide-coated cathodes, **3168**; radiation from car ignition systems, **1233**
Easton, A., with E. Cohen, field-sequential colour companion, **2844**
Eastop, R. H., with T. Williams, measurement of harmonic distortion in iron-core transformers, **2232**
Ebert, W., reception in Switzerland of WWV standard-frequency transmissions, **1476**
Eckart, F., Type-OSW electron microscope, **1743**
Eckart, G., propagation of e.m. waves in heterogeneous layers, **1882**; radiation from magnetic dipole in spherically stratified atmosphere, **2800**; reflection of e.m. waves at discontinuity of permittivity, **723**
—— and T. Kahan, 'internal' reflection in stratified medium, and application to the troposphere, **718**
—— with T. Kahan, e.m. waves in atmospheric duct, Green's function for, **719**, theory of propagation in, **1465**; nonexistence of surface wave, **2517**
Edelman, S., with R. K. Cook, correlation coefficients as criteria for randomness of sound fields, **(A)547**
—— with others, long-tube method for determination of sound-absorption coefficients, **(A)548**
Edels, H., technique for arc initiation, **2971**
Edwards, C. M., precision decade oscillator for 20 c/s–200 kc/s, **2237**
Edwards, E. V., and K. Garoff, resonant waveguide window for high power, [illegible]
Eggenberger, D. N., with P. L. Copeland, field at cathode as function of space current, **506**
Ehmert, A., cosmic radiation from sun, **103**; solar and terrestrial phenomena during sudden ionospheric disturbance 19th Nov. 1949, **885**
Ehrenberg, W., and W. E. Spear, e.s. focusing system in fine-focus X-ray tube, **1450**
—— Chi-Shi Lang and R. West, electron voltaic effect, **2303**
—— with F. Ansbacher, electron-bombardment conductivity of dielectric films, **2196**
Einstein, P. A., factors limiting accuracy of measurement in electrolyte tanks, **1713**
Eisaman, L. C., microwave sweep generator, **414**
Eisenstein, A., leaky-capacitor oxide-cathode interface, **2052**
Ekelöf, S., and B. Nilsson, high-sensitivity automatic recording potentiometer, **1969**
Elger, H., calculation of CR elements using nonlinear resistances, **2356**
Elias, G. J., S. Duinker and Tan Soen Hong, influence of initial phase in nonlinear circuits, **2673**
Elias, P., autocorrelation and entropy, **3105**
Ellenwood, R. C., with others, evaluation of coaxial-slotted-line impedance measurements, **1963**
Elliot, H., with others, cosmic-ray intensity and radio fade-outs, **1763**
Elliott, H. A., with others, diffraction errors in optical investigation of aerial pattern, **2110**
Ellis, N. W. W., moving-coil voltage stabilizer of high sensitivity, **230**
Ellis, R. T., with G. S. Sloughter, linear discriminator for f.m. telemetering, **2783**
Ellison, M. A., source points of radio noise and solar flares, **2986**
Ellrodt, F., overseas-radio installations at Frankfurt a.M., **446**
Ellyett, C. D., influence of high-altitude winds on meteor-trail ionization, **339**
Elmore, W. C., H. Kallman and C. E. Mandeville, construction of radioactivity instruments, **3079**
Emerson, W. H., with others, dispersion mechanisms in ferrites, **337**
Emms, E. T., and E. Jones, video output stage, **1268**
Endt, P. M., with C. T. J. Alkemade, coupling of a.c. galvanometer to amplifier, **2480**
Engbert, W., with others, u.s.w. transmitting valves, **2872**
Engel, A., crystal detectors and use at u.h.f., **775**
Engineering Research Associates, High-Speed Computing Devices, **(B)937**
Ensing, L., with J. M. L. Janssen, electro-analogue for studying regulating systems, **2782**
Epelboin, I., eddy currents for investigating ferromagnetic substances, **1933**
—— with others, properties of magnetic powders at u.h.f., **372**
Epprecht, G., logarithmic wide-band amplifier, **3063**
Eppstein, J. S., single-channel pulse-height analyser ,**1577**
Epstein, D. J., phase shift of microwaves in passage through parallel-plate arrays, **(A)2100**
Epstein, H., synthesis of passive RC networks, **2940**; transients in active 4-terminal network, **2944**
Erastov, L. N., with S. G. Kalashnikov, formation of barrier layers by welding, **2729**
Erginsoy, C., mechanism of impurity-band conduction in semiconductors, **907**
Erickson, R. A., and H. Sommer, distortion correction for video delay lines, **52**
Erlandson, P. M., with J. Ohman, vibrotron transducer, **(A)2245**
Eros, S., with B. T. Barnes, measurement techniques for dynamic characteristics of low-pressure arc, **1135**
Espe, W., and E. B. Steinberg, Al-clad iron for electron valves, **1949**
—— M. Knoll and M. P. Wilder, getter materials for valves, **499**
Espersen, G. A., and B. Arfin, l.v. tunable X-band magnetron, **3184**
Espley, D. C., optimum spacing of broadcasting transmitters, **1490**
Ess, H., and J. Rossel, properties of diamond as crystal counter, **424**
Essen, L., cavity-resonator method of determining velocity of e.m.waves, **1225**; frequency standardization, **2224**; proposed value for velocity of light, **1609**
—— and K. D. Froome, dielectric constant of air at 24 kMc/s, **1707**
Essigmann, M. W., with others, statistical properties of speech sounds, **(A)540, 1327**
Estermann, I., and A. Foner, magnetoresistance of Ge at 20°–300°K, **661**
Estrin, G., effects of anisotropy in 3-dimensional array of conducting disks, **2923**
Etzold, H., and H. Jahn, sensitivity limit of mains-driven d.c. amplifiers, **1602**
Evans, G. S., with others, cheese aerials for marine navigational radar, **1080**
Evans, W. E., Jr, phase-to-amplitude modulation for u.h.f. television transmitters, **477**
Evans, W. E., Jr, with M. G. Morgan, synthesis and analysis of elliptic polarization loci, **2416**
Evison, F. F., source of elastic waves in ground, **2085**
Ewald, A. W., photoconductivity of Tl_2S cells, **2043**
Ewald, W. F., development of Telefunken broadcast receivers since 1945, **2530**
Ewels, J., with H. K. Henisch, electrical forming effects at Se contacts, **926, (D)1949**
Ewing, D. H., air-traffic control theory, **(A)2186**
Exley, K. A., bass tone control in sound reproduction, **2090**
Eyfrig, R., ionospheric disturbance caused by aurora borealis 20th–21st Feb. 1950, **1150**
—— E. Harnischmacher and K. Rawer, world-wide F_2 ionization, **634**

F

Fabelinski, I. L., with T. S. Velichkina, velocity of ultrasonic waves in fluids, **2084**
Fagot, J., effects of linear distortion in long mismatched line, **42**
Falkenhagen, H., and H. Jacob, theory of electrostriction in Onsager liquids, **2141**
Familier, V., cross-modulation between two transmitters connected to one aerial, **1507**
Fan, H. Y., temperature dependence of energy gap in semiconductors, **3016**
Fan, S. P., with M. Chodorow, f.m. high-efficiency klystron transmitter, **(A)2304**
Fanning, G. B., and F. P. Miller, tropospheric radio propagation, **(A)2799**
Fano, R. M., information theory and speech communication, **(A)737, 1238**; short-time autocorrelation functions and power spectra, **141**
Faran, J. J., Jr, scattering of sound by cylinders and spheres, **(A)522, 2611**
Farnell, G. W., with others, multichannel p.a.m.-f.m. radio telemetering system, **1443**
Farnsworth, H. E., and M. J. Lun, secondary emission of Ni-Ba mixtures and Rh bombarded by 50–8 000-eV electrons, **1399**
Fatehchand, R., positive-ion formation in air prior to h.f. breakdown, **2144**
Favorin, V. N., secondary electron emission from thin films of $CaCl_2$, **2403**
Fawcett, S. L., and E. C. Crittenden, Jr, ejection of electron beam from betatron, **961**
Fay, C. E., D. A. S. Hale and R. J. Kircher, 1·5-kW 500-Mc/s grounded-grid triode, **3178**
Fechner, P., with J. Ortusi, modulation on waveguides, **1012**
Federici, M., underwater television by means of ultrasonics, **251**
Feeny, H., with others, spurious counts in G-M counters, **1990**
Fehr, E. B., and A. P. Haase, new valve materials, **(A)2194**
—— with A. P. Haase, new valve materials, **3161**
Feiker, C. E., and S. C. Clark, Jr, longitudinal slots in circular waveguides, **2105**
Fein, L., ultrasonic underwater 'point' receiver probe, **1064**
Feinberg, R., high-gain magnetic amplifier, **2360**; review of transductor principles and applications, **291**
Feinstein, J., interpretation of radar echoes from meteor trails, **1885**
Feit, L., with others, crosstalk in time-division multiplex systems, **740**
Feldmann, A. A., precision casting vs electroforming of microwave components, **2913**
Feldtkeller, R., and H. Hettich, variation of magnetic after-effect in powder cores, **2446**
Felix, W., ultrasonic nondestructive testing, **2493**
Felsen, L., and N. Marcuvitz, half-space as spherical transmission line **(A)2100**
Feltscheer, N. S., proposed mobile R/T services, Australia, **1774**
Fennessy, E., decca as aid to marine navigation, **2188**
Feofilov, P. P., with N. A. Tolstoi, new method of studying relaxation processes, **1872**
Ferguson, A. E., c.r.o. for long-duration transients, **1718**
Féron, R., and C. Fourgeaud, information and regression, **2272**
Ferraro, V. C. A., southward shift of auroral zone during intense magnetic storms, **878**
—— W. C. Parkinson and H. W. Unthank, sudden commencements and impulses in geomagnetism, **2708**
Ferrell, E. B., control chart in analysis of experimental data, **2674**
Ferrell, O. P., enhanced transequatorial propagation following geomagnetic storms, **2807, (A)2799**
Ferrero, M., and G. Sacerdote, sound-transmission parameters for granular absorbing materials, **16**
Ferris, W. R., characteristics of diodes with oxide-coated cathodes, **(C)1801**
Fert, C., apparatus for electronoptical demonstrations, **3083**
—— with H. Dessens, spider-thread grids for electron microscopy, **1452**
Feshbach, H., with C. M. Harris, acoustics of coupled rooms, **15**
Fetch, E. P., V. E. Legg and F. G. Merrill, d.c. amplifiers using magnettors, **(A)212**[illegible]
Field, L. M., Ping King Tien and D. A. Watkins, amplification by acceleration and deceleration of single-velocity beam, **2068**
Finch, H. F., periodic fluctuation in length of day, **150**
—— with H. W. Newton, solar activity and geomagnetic storms, 1950, **1631**
Finch, H. W., with D. G. A. Thomas, simple electrometer using vibrating-plate capacitor, **159**
Finden, H. J., frequency generation and measurement, **(D)1188**
Findley, W. G., tests to select engineers, **(A)2308**
Fine, E. C., experimental prototype of Rinehart-Luneberg lens, **(A)2100**
Fink, D. G., colour fundamentals for television engineers, **1610**; television broadcasting in U.S.A., 1927–1950, **2030**
Finkbein, U., with W. Burkhardtsmaier, circularly grouped aerials as omnidirectional and unidirectional radiators, **568**
Finlay, E. A., J. F. Fowler and J. F. Smee, field measurements on model betatron and synchrotron magnets, **699**
Finn, G. B., W. B. LaBerge and E. A. Coomes, Schottky effect for polished Ta, **1931**
Finzi, L. A., and D. C. Beaumariage, magnetic-amplifier characteristics, **1092**
—— with others, analysis of feedback magnetic amplifiers, **47**
Fischbach, A., special purpose batteries, **232**
Fischer, A., air safety measures at Zürich-Kloten airport, **3009**
Fischer, B., Radio and Television Mathematics, **(B)387**
Fischer, F. A., electromechanical couplings, **808**; piezoelectric sound detector and equivalent circuits, **2326**; reciprocal-resistance relation between piezoelectric and electrodynamic transducers, **552**; symposium on information theory, **2533**
—— and U. John, calculation of input impedance of coupled circuits, **2384**
Fischer, K., calculation of broadcast transmitting aerials, **2916**
Fischer, L. G., design of single-frequency phase-shifting networks, **302**
Fisher, C. R., with F. R. Abbott, directivity produced by parasite parallel to vertical aerial, **41**
Fisher, J., television line selector with automatic identifier, **(A)2292**
—— with others, flying-spot colour-signal generator, **(A)2292**
Fitts, P. M., air-traffic control systems and human operators, **(A)2186**
Fitzgerald, A. S., feedback in magnetic amplifiers, **1091**
Fitzpatrick, J. A., J. C. Hubbard and W. J. Thaler, high-intensity-spark light source, **1222**
Flack, W. I., television interference-suppression circuits, **1504**
Flanagan, J. L., effect of delay distortion on speech intelligibility, **2323**
Fleck, J. T., and P. F. Ordung, transfer ratio synthesis by RC networks, **(A)2122**
Flegler, E., oxide ferromagnetic materials, **1166**
Fleischmann, R., notation for electrodynamics, **89**
Fleming, L., aids to c.r.o. display of phase angle, **1719**
Fletcher, E. W., and S. P. Cooke, stabilization of microwave oscillator with NH_3 absorption line, **(A)1958**
Fling, W. D., continuously variable equalizer, **2129**
Flood, J. E., and J. R. Tillman, crosstalk in a.m. time-division multiplex systems, **2830**
Florman, E. F., with others, source of error in radio phase-measuring systems, **(D)2433**
Flory, L. E., and others, portable television pickup equipment, **(A)2292**; storage oscilloscope, **3055**
Floyd, C. F., and R. L. Corke, measurement of electrical characteristics of piezoelectric resonators, **1704**
Fluharty, R. G., with others, measurement of resolving time of counters, **715**
Flynn, T., with others, effect of auxiliary current on transistor operation, **2591**
Fockler, W. G., new techniques in impulse testing, **(A)2226**
Foner, A., with I. Estermann, magnetoresistance of Ge at 20°–300°K, **661**
Fontanellas, G., ⅓-octave variable filter, **1825**
Fontes, L., and R. Moret, auxiliary circuits for G-M counters, **1105**
Foord, T. R., positive point-to-plane spark breakdown of compressed gases, **338**
von Foerster, H., and J. S. Schaffner, principles in production of submillimetre waves, **(A)2122**
Foot, J. B. L., communication tests in railway tunnels, **990**
Ford, J. R., with N. I. Korman, achromatic microwave aerial, **(D)1078**
Ford, L. H., with G. H. Rayner, stability of N.P.L. mica standards of capacitance, **2988**
Forman, R., and G. F. Rouse, oxide-cathode base-metal studies, **1527**
Forrer, R., intermittent activation in ferromagnetic materials, **2782**
Forrester, J. W., digital computers in simulated control systems, **(A)2945**; digital information storage using magnetic cores, **1421**
Forsgren, S. K. H., with O. E. H. Rydbeck, theory of electron-wave tubes,
Försterling, K., and H. O. Wüster, origin of harmonics in ionosphere, **721**; reflection in inhomogeneous medium, **2187**
Fortrat, R., pendular and relaxation oscillations, **2131**
Foster, H. G., with others, measurement of gyrointeraction, **155**
Foster, T. J., with H. H. Davids, crowded-band mobile equipment, **3117**
Fouret, R., cathode centering in X-ray tube, **2597**
Fourgeaud, C., with R. Féron, information and regression, **2272**
Fowler, A. D., with others, quality rating of television images, **751**
Fowler, C. S., narrow-pulse generator, **694**, (D)**2776**
Fowler, F. E., and D. S. Johnson, servo guider for solar telescopes, **2779**
Fowler, J. F., with others, field measurements on model betatron and synchrotron magnets, **699**
Fraise, —, with P. Andrieux, production control of permeability, **2233**
Francis, J. E., Jr, P. R. Bell and J. C. Gundlach, single-channel analyser, **2357**
Frank, M., new system of facsimile, **237**
Frankel, S. P., with others, predicting phase behaviour with digital computers, **(A)1749**
Franklin, E., and W. R. Loosemore, survey equipment using l.v. halogen-quenched G-M counters, **2258**
Franklin, J., radio background of radar, **639**
Fränz, K., relations between signals and spectra, **2376**
Franz, W., formulation of Huyghens' principle, **192**; mechanism of breakdown in solid insulating materials, **2148**; theory of diffraction, **323**, at a screen, **1129**
Fraser, W. B., 15-W direct-coupled a.f. amplifier, **2134**
Fray, S. J., with others, h.f. resistance standards for calibration of admittance bridge up to 60 Mc/s, **691**
Frayne, J. G., with others, professional magnetic-recording system for films, **2629**
Fredendall, G. L., and R. C. Kennedy, linear-phase-shift video filters, **308**
Freedman, J., resolution in radar systems, **3002**
Freiesleben, H. C., with W. Stanner, hyperbolic aerial-navigation systems, **1393**
Fremlin, J. H., and J. S. Gooden, cyclic accelerators, **2789**
French, J. C., electrode deterioration in t.r. tubes, **1515**
French, J. L., a.f. equipment for British civil-aviation network, **2544**
Frenkel, Ya. I., with others, formation of conducting bridges in suspensions, [illegible]
Frey, A. R., with L. E. Kinsler, Fundamentals of Acoustics, **(B)1561**
Frey, W., and F. Lüdi, theory of travelling-wave valve, **1518**
Freymann, R., microwave absorption and molecular structure, **619**
Fricke, H., measurement of small angles of elevation of incoming e.m. metre waves, **433**
—— with L. Pungs, measurement of small angles of elevation of incoming e.m. metre waves, **432**
Friedlander, F. G., forced vibrations of quasilinear systems, **1177**
Friedman, B., amplification of travelling-wave valve, **2579**; mathematical developments in tropospheric propagation theory, **(A)2799**
Friedman, M. D., determination of eigenvalues by use of generalized Laplace transform, **1178**
Friend, A. W., magneto-optical transducers, **1295**
Fromageot, A., with P. Belgodère, Newtonian potentials in design of f.m. amplifiers, **2388**
Froome, K. D., with L. Essen, dielectric constant of air at 24 kMc/s, **1707**
Fry, D. W., and W. Walkinshaw, linear particle accelerators, **180**
—— and others, design and operation of 30-MeV synchrotron, **1213**
Fry, E. J., ultrasonic projector design, **795**
Fry, F. J., with others, ultrasonic effects on animal tissues, **1050**
Fry, R. B., and W. J. Fry, crystal systems with low loss, **1551**
—— with others, ultrasonic variable-frequency crystal oscillators, **(A)525, 1552**
Fry, W. J., and V. J. Wulff, ultrasonic irradiation of nerve tissue, **(A)528**
—— R. B. Fry and W. Hall, ultrasonic variable-frequency crystal oscillators, **(A)525, 1552**
—— and others, ultrasonic effects on animal tissues, **1050**
—— with R. B. Fry, crystal systems with low loss, **1551**
—— with W. L. Hall, variable resonance-frequency crystal transducers, **23**[illegible]
Fuchs, G., characteristics of coaxial pairs at 20 Mc/s, **27**
Fucks, W., retroaction and similitude consideration in starting gas discharge, **1131**; variations of parameters in preliminary discharges, **2143**
Fuller, D. J., with others, comparison of triodes and beam tetrodes as output valves in a.f. amplifiers, **1123, (D)2959**
Fünfer, E., and H. Neuert, oversize pulses in vapour-filled counter tubes, **1455**
Fürth, R., masses of fundamental particles, **97**; space-charge distribution, characteristic and current fluctuations in double diodes, **3174**

G

Gabor, D., The Electron Microscope, its Development, Present Performance and Future Possibilities, **(B)1992**; electronoptical systems with helical axis, **1985**; photons and waves, **208, 1484**
Gabriel, W. F., frequency stabilization system for measurement of microwave refractive index of gases, **(A)2226**
Gadsden, C. P., electrical network with varying parameters, **595**
Gaffney, F. J., impedance measurements at 50–1000 Mc/s, **(A)2784**
Galbraith, R. A., with D. K. Cheng, stagger-tuned loop aerials for wide-band l.f. reception, **(A)2100**
Gale, H. M., and P. D. Atkinson, series-connected magnetic amplifier, **(D)1093, (D)1581**
Gallet, F., magnetic recording of sound, **811**
Gallet, R., and K. Rawer, long-term relation between F_2-layer ionization and solar activity, **1149**
Gal'perin, F., magnetic properties, of alloys of Mn with Ni and Co, **2443**, of well ordered alloys, **2444**, of well-ordered Co/Mn alloys, **3019**
Ganet, M., valve-testing methods of French P.T.T., **2772**
Gans, R., sheathed Lecher system, **29**
Garbuny, M., graphical representation of particle trajectories in moving reference system, **770**
—— and G. E. Sheppard, reflex resnatron operation, **(A)2304**
—— with others, reflex resnatron, **(A)2304**
Gardner, B. C., with R. C. Hergenrother, recording storage tube, **(C)788, (C)3131**
Gardner, F. F., atmospherics in study of l.f. propagation, **1473**
Garlick, G. F. J., phosphors and phosphorescence, **123**
Garman, R. L., and R. W. Lee, proposed closed-loop theatre television system, **3133**; television image tubes and techniques for films, **1792**
Garner, L. E., Jr, square-wave generator using gated-beam tube, **3061**
Garoff, K., with E. V. Edwards, resonant waveguide window for high power, **566**
Garrett, F. W., design and application of marine radar equipment, **1911**
Garrett, J. W., with J. Bernhart, stereophonic broadcasting of music, **1060**
Gartlein, C. W., protons and aurora, **1650**
—— and R. K. Moore, southern extent of aurora borealis in N. America, **1668, (A)2712**
Garven, K. M., long-line attenuation equalization, **2915**
Garwin, R. L., pulse generator for mμs range, **951**
Gates, R. F., with W. R. LePage, feeder problems in broad-band aerial arrays, **(A)2642**
Gauger, R., and J. Sommer, bridge-stabilized generator for tuning musical instruments, **593**
Gaulé, G., bibliographical survey of transistor theory and applications, **778**
Gaunt, H. M., and J. D. Craggs, electrical and optical characteristics of d.c. corona discharge, **2145**
Gauvenet, A., with others, compressor/expandor units of French P.T.T., **306**
Gavreau, V., musical stroboscopes and strobographs, **2887**
Gebauer, R., e.m. oscillations in high-efficiency v.m. valves, **1036**
—— and H. Kosmahl, efficiency of oscillation generation in v.m. valves, **2602**
van Geel, W. C., and B. C. Bouma, frequency variation of dynamic characteristic of system Al-Al_2O_3-electrolyte, **2286**
—— and A. J. Dekker, a.c. electrolytic capacitors, **1100**
—— and J. W. A. Scholte, capacitance and dielectric losses of Al_2O_3 layer, **3022**
—— with A. J. Dekker, rectifier properties of system Al-Al_2O_3-electrolyte, **1234**
Geisler, A. H., precipitation and domain structure of alnico V, **1672**

Geist, D., diode rectifier, 2677
Geiswald, K. H., with W. Dieminger, solar and terrestrial phenomena during sudden ionospheric disturbance 19th Nov. 1949, 885
George, D. R., R. G. E. Hutter and M. Cooperstein, rotating-beam method for investigating electron lenses, (A)2245
George, H., and L. Metzger, Samica mica paper, 1407
George, T. S., analysis of synchronizing systems for dot-interlaced colour television, 2027
George, W. D., quartz-crystal frequency standards, (A)1958
Gerber, E. A., amplitude of vibration of piezoelectric crystals, 2383; h.f. vibrations of plates cut from isometric and tetragonal crystals, [illegible]
Gerber, W., external synchronization of home-television pictures, 246; radio-beam system planning, 218
Gerlach, A. A., distortion in ph.m., 449; electrical-mechanical equivalent-network synthesis, (A)2284
—— and D. S. Schover, pulse-width discriminator, 2784
Gerlough, D. L., and H. R. Kaiser, counter circuit with outputs at several predetermined counts, 1585
Germain, J., with others, adsorption on semiconductors, 1667
Gerson, N. C., aurora, correlation with increased cosmic-ray intensity, 2292, radio observations on 19th Nov. 1949, 2716; sporadic-E movements, on 13th June 1949, 2998, on 21st June 1949, 2426; stratosphere/ionosphere relations, 1146
—— and J. Kaplan, nomenclature for upper atmosphere, (D)1643
Geschka, H., and F. Lange, styroflex capacitors, properties and applications, 2121
Geselius, R. J. E., manufacture of small metal tubes by electro-deposition on nylon fibres, 672
Gherzi, E., echoes from D and F layers on 21·7 Mc/s, 1756
Ghirardi, A. A., and J. R. Johnson, Receiver Circuitry and Operation, (B)3104
Ghosh, B. B., ultrasonic dispersion and absorption in water, 1548
Ghosh, C., generalized circle diagrams in network analysis, 2665
Giacomo, P., with others, evaporation in vacuo by direct bombardment, [illegible]
Gianola, U. F., spherical aberration of magnetic electron lenses, correction of, 1219, reduction of, 183
Gibberd, W. O., control-terminal equipment for overseas R/T services, 1773
Gibbons, J. J., and R. J. Nertney, wave solutions of ionosphere-reflected long waves, (A)2799
Giboin, E., radar development in French navy, 2187
Gibson, A. F., sensitivity and response time of PbS photoconductive cells, [illegible]
—— with R. P. Chasmar, long-period photoeffects in PbS, 3156
Gibson, J. E., with others, effect of auxiliary current on transistor operation, 2591
von Gierke, H. E., and W. W. von Wittern, condenser-microphone sensitivity measurement, 2624
Giger, A., reactance-valve oscillator, (D)71
Gigli, A., with G. G. Sacerdote, absorption of sound by resonant panels, 2325
Gihring, H. E., television 'super-turnstile' and 'super-gain' aerials, 2919
Gilchrist, J. D., with J. P. Blom, distance-measuring equipment for civil aircraft, 1918
—— with others, distance-measuring equipment for civil aircraft, 1392, [illegible]
Gill, A. J., recent developments in telecommunication engineering in Britain, 1768
Gill, S., diagnosis of mistakes in programmes on EDSAC, 2755; step-by-step integration in automatic digital computer, 1695
Gillam, C., Wrotham aerial system, 2340, 2643
Gillette, F. N., and R. A. White, video recording camera, 3135
Gillman, R. E., with R. M. Badenach, radio navigation aids for civil aviation, 897
Giltay, J., ferromagnetic states, 126
Gilvarry, J. J., Einstein's equivalence principle and blind navigation, 899
—— and S.H. Browne, application of Liouville's approximation to problem of blind navigation, 900
Gindin, L. G., and others, formation of conducting bridges in suspensions, [illegible]
Ginzburg, V. L., cosmic rays as source of galactic r.f. radiation, 2424
Ginzton, E. L., with others, design of 10^9-eV linear electron accelerator, (A)2245
Gipps, G. de V., with R. W. E. McNicol, characteristics of E_2 region at Brisbane, 1899
Girardeau, J., design and applications of h.f. heating equipment in France, 178, 959
Gish, O. H., and G. R. Wait, thunderstorms and earth's general electrification, 869
Gisolf, J. H., back current in blocking-layer rectifiers, 374
Gitzendanner, L. G., RC twin-T filter analysis, 1857
Glaser, J. L., and S. H. Van Wambeck, experimental evaluation of diversity receiving systems, 2267
Glaser, W., calculation of constants of magnetic electron lenses, 703, (C)2504; electronoptical refractive index and the Routhian function, 1741
—— and O. Bergmann, foci and focal lengths in electronoptics and strong electron lenses, 2505, 2796
—— and F. Lenz, calculation of image formation for magnetic lenses, 3081
Glass, F. M., with C. G. Goss, line-noise interference with particle counting, 1744
Gleichauf, P. H., breakdown over insulators in high vacuum, 2454, 2747
Gleissberg, W., forecast of solar activity, 2701
Glinski, G., and S. Lazecki, plug-in units for digital computers, (A)2220
Glinz, C., field-strength fluctuations of Swiss broadcasting stations, 2816; ionosphere reflection coefficient and scattering of ground wave, 878
Godard, L., and C. Lafarque, measurement of charges on particles of mist or rain, 355
Godoli, G., with G. Righini, physical significance of solar character figures, [illegible]
Goebel, G. W., photo radiation patterns, 2650
Goeddel, W. V., and D. M. Yost, ferromagnetism in Mn-In system, 2442
Goedhart, D., with others, 48-channel carrier telephone system, 739, 2013
Goetz, H., measurement of ultrasonic radiation pressure, 798
Gold, L., multiple-echo effect due to release of stored wave train, 1819
Golde, R. H., 'sferics' and lightning discharges, 638
Goldman, J. E., single-crystal magnetostriction constants of Fe/Co alloy, 871
—— and R. Smoluchowski, theory of magnetic anisotropy in alnico V, 369
Goldsmith, A. N., and others, Television, Vols. 5 & 6, (B)2038
Goldstein, L., M. Lampert and J. Heney, magneto-optics of electron gas with guided microwaves, 2911
—— with P. Parzen, current fluctuations in d.c. gas-discharge plasma, 2974; hydrostatic pressure in electron beam in travelling-wave valves, 2580
Goldwater, D. L., and R. E. Haddad, refractory compounds as thermionic emitters, 1400
Gondet, H., disk-type rotary molecular vacuum pump, 1160
Gondry, R., high-definition projection receiver, 3141
Goodale, E. D., with C. L. Townsend, orthogam television amplifier, 759
Goodall, W. M., television transmission by p.c.m., 1496
Goode, H. H., simulation in system design, (A)2245
Gooden, J. S., with J. H. Fremlin, cyclic accelerators, 2789
Goodman, P. D., with others, capacitance bridge for h.f., 1717
Gordon, A. N., e.m. induction in uniform semi-infinite conductor, 2156; external field induced by oscillating magnetic dipole, 2155
Gordon, C. C., and J. C. Richmond, thickness gauges for ceramic coatings, 696
Gordon, W. E., with H. G. Booker, theory of radio scattering in troposphere, 727
Gordy, W., mm-λ measurements, (A)1958
Goryunova, N. A., with A. I. Blum, electrical properties of grey tin, 2199
Gosling, J. B., with M. J. Zunick, glass selection and production techniques for X-ray and other tubes, 2214
Goss, C. G., and F. M. Glass, line-noise interference with particle counting, 1744
Gossick, B. R., energy distribution in Johnson noise pulses, 50
Goubau, G., surface-wave transmission line, h.f., 281, 812, (A)2100, single-conductor, [illegible]
Goucher, F. S., measurement of hole diffusion in *n*-type Ge, 1668
—— and others, theory and experiment for Ge *p-n* junction, 1669
Gould, K. E., equalization of coaxial lines, 836
Gouriet, G. G., video-frequency amplifier couplings, 590
Goward, F. K., and others, design of electron synchrotons, 1212
Grace, C. H., with others, timing unit and pulse deflector generator for synchrocyclotron, (A)2245
Graffunder, W., and H. Schultes, c.r.o. display of valve characteristics, 692
Graham, J. F., automatic a.c. bridges, 1715
Granier, J., recording of very-high-speed phenomena, 3073
Gray, G. W., and A. S. Jensen, sequential operation of beam-deflection storage tubes, 1317
Gray, W. C., with others, microwave study of high-pressure arc, 1132
Grayson, H., X-cut quartz crystals, 561
Green, E., s.w. self-oscillator circuits, 844
Green, H. S., and K. C. Cheng, reciprocity theorem of electrodynamics, 2690
Green, P. E., Jr, magnetic-tape recorder for 1–100-c/s electrical signals, 970
Greene, J. C., corrugated waveguide band-pass filters, 2912
Greenhow, J. S., fluctuation of echoes from meteor trails, 359
Greenough, M. L., and W. E. Williams, circuit for measuring displacement of pressure-sensitive diaphragms, 1439
Greenwald, C., with A. R. Vallarino, low-distortion f.m. modulators, (A)2298
Greenwood, J. H., accurate time for broadcasting studios, 2757
Greenwood, R. W., electronic relays in automatic process-control systems, (A)2245
Gregoretti, G., r.f. conductance of insulators for overhead lines, 379
Greinacher, H., new e.s. voltmeter, 947
Grey, L. E., pulsed emission from BaO-SrO-CaO-system, 2055
Gridley, D. H., asynchronous control for digital computer, (A)2220
Griese, H. J., tube microphone, 273
Griffiths, D. H., with others, experimental determination of geomagnetic radial variation, 351
Griffiths, J. H. E., and J. R. MacDonald, oscillation-type magnetometer, 1711
Grillot, E., and M. Bancie-Grillot, state of oxidation and luminescence colour of ZnS-Cu, 645
Grisdale, G. L., high-stability directly calibrated oscillator, 2819
Grisdale, R. O., A. C. Pfister and W. van Roosbroeck, carbon and borocarbon pyrolytic film resistors, 2365
Grivet, P., and J. Vastel, preliminary measurements on linear electron accelerator, 1738
Grometstein, A. A., approach to steady state of linear variable network containing one reactance, 588
de Groot, W., cyclotron and synchrocyclotron, 1449
—— with F. A. Kröger, effect of temperature on fluorescence of solids, 905
Gross, B., inversion of Laplace transform, 383
Gross, E. P., plasma oscillations in static magnetic field, 2151
Grossbohlin, H., design of 90°-deflection picture tubes, (A)2292
Grosskopf, J., theory of receiving aerials, 819
Grotrian, W., interpretation of sunspot phenomenon, 863
Grover, F. W., calculation of magnetic fields of circular filaments and solenoids, 91
Gruen, H., with others, propagation characteristics in coaxial structure with two dielectrics, 1564
Gruenberg, H., second-order beams of slotted-waveguide arrays, (A)2642
Grundfest, H., design of amplifiers for study of bioelectric potentials, 75
—— with others, instantaneous peak voltmeter, 2481
Grunsky, C., with others, i.c.w. system for distance measurement, (A)2186
de Gruyter, E., reverberation time and sound power required for ordinary rooms, 14
Gubanov, A. I., theory of contact between semiconductors of different types, 2745
Guénard, P., with others, delay lines of comb or interdigital type, 772
Guenther, R., r.f. amplifier design for low noise figure, (A)2122
Guertler, R., impedance transformation in folded dipoles, 34
Guilbert, C., two 'grid-dip' oscillators, 2769
Guillaud, C., magnetic properties of mixed ferrites of Mg and Zn, 1673
—— and M. Sage, magnetic properties and structure of Fe_2O_3.ZnO, 1401
—— with others, ferromagnetic resonance in ferrites, 1674
Gum, C. S., with C. W. Allen, survey of galactic noise at 200 Mc/s, 867
Gundlach, F. W., application of quadripole theory to waveguide systems, 814; Grundlagen der Höchstfrequenztechnik, (B)3191
Gundlach, J. C., with others, single-channel analyser, 2357
Gunn-Russell, C., with others, broadcasting programmes, design of automatic monitors for, 1491, portable repeater for, 2831
Gunter, F. B., Westinghouse Type-FB 960-Mc/s multiplex transmitter-receiver, 988
—— with others, field tests of microwave multiplex system, 1243
Günther, —, properties of double-T quadripole between finite resistances, 1589
Gupta, Q. C., and F. Duerden, geometrical solution of transmission-line problems, 1068
Gutin, S. S., oxide layer on Al and temperature dependence of electrolytic capacitor, 2750
Gutmann, F., with B. Breyer, processes in dielectrics containing free charges, 1875
—— with others, resistance/temperature relation for thermistors, 1083
Gutsmann, F., specification for u.s.w. f.m. West German broadcasting transmitters, 2856
Guy, R. F., u.h.f. television reception at Bridgeport, Conn., 2037
Gvozdover, S. D., and V. M. Lopukhin, theory of anode block of plane magnetron, 2598

H

Haag, J., concerning Mathieu's equation, 1583
Haaijman, P. W., with others, controlled-valency semiconductors, 905
Haantjes, J., self-oscillating line-deflection circuit, 490
—— and F. W. de Vrijer, flicker in television pictures, 1503
Haar, G., transmission factor of electrodynamic sound receiver, 2625
Haas, P. H., with others, noise figure standards, (A)2226
Haase, A. P., and E. B. Fehr, new valve materials, 3161
—— with E. B. Fehr, new valve materials, (A)2194
Hackett, W., graphs and abacs for distortion in i.f. amplifiers, 1122
Hada, T., with others, travelling-wave c.r. tube, 503
Haddad, R. E., with D. L. Goldwater, refractory compounds as thermionic emitters, 1400
Hadfield, D., permanent-magnet lenses for television tubes, (D)484
Hadlock, C. K., and D. Lebell, studies of pulse-transformer equivalent circuits, 1318
Haggis, G. H., with others, dielectric dispersion of dioxan-water mixtures, 3027
Hagopian, R. H., load matching for dielectric heaters, 1206
Hague, W. M., with R. A. Soderman, u.h.f. measurements with Type-874 LB slotted line, 1714
Halacsy, A. A., double-ratio current transformers, 2115
Hale, H. A. S., with others, 1·5-kW 500-Mc/s grounded-grid triode, 3178
Hall, A. C., simulation of feedback control systems, (A)2245
Hall, C. E., scattering phenomena in electron microscope image formation, 2502
Hall, F. L., coverage of standard-frequency station WWVH, 1190
Hall, R. N., and W. C. Dunlap, preparation of *p-n* junctions by impurity diffusion, 378
Hall, W. L., and W. J. Fry, variable resonance-frequency crystal transducers, 2318
—— with others, ultrasonic variable-frequency crystal oscillators, (A)525, 1552
Hall, W. M., and W. L. Pritchard, optimum operation of echo boxes, 2720
Halla, F., with L. Castelliz, ferromagnetic interactions in Mn alloys, 915
Hallows, R. W., Radar Simply Explained, (B)1394
Halpern, O., optics of radio waves, 3092
Hamaker, H. C., and T. Hehenkamp, minimum-cost transformers and chokes, 1853, 2931
Hamburger, F., Jr, with C. H. Rothauge, measurement of equivalent-circuit constant of quartz crystals, 392
Hamer, E. G., planning v.h.f. mobile systems, (D)987
Hamilton, G. E., technical considerations of television recording, (A)2292
Hamilton, R. E., with others, precision coaxial resonant line for impedance measurements, (A)1958
Hammer, I. W., with others, noise figure standards, (A)2226
Hani, P., R/T for communication with vehicles, 3116
Hanle, W., scintillation counter, 2512
Hanley, T. E., ThS as thermionic emitter, 919
Hanna, R. B., with others, static magnetic memory unit for low-cost computers, 1422
Hannahs, W. H., R. Bahr, Jr, and J. Caffiaux, semi-automatic manufacture of audio and video equipment, (A)2292
Hansen, J. R., with others, reflex resnatron, (A)2304
Hanson, O. B., with F. G. Kear, television aerials on Empire State Building, 1568
Hardie, A. M., pulse technique in high-power valve development, 2578
Hardy, H. C., and F. G. Tyzzer, scale-model studies of amphitheatre acoustics, (A)549
—— and others, comparison of absorption coefficients, (A)1811
Harker, M. G., with E. L. C. White, equipment for use with C.P.S. emitron, 755
v. Harlem, J., photophoresis, magnetophotophoresis, magneto-chemical effect, [illegible]
Harman, W. W., relation of Nyquist diagram to pole-zero plots in complex frequency plane, 1066
Harnischmacher, E., with others, ionospheric observations at Dakar, 1148; world-wide F_2 ionization, 634
Harper, D. H., use of consol in fishing fleet, 2188
Harper, W. R., Volta effect as cause of static electrification, 1612
Harrington, B. G. V., with J. A. Tanner, frequency-compensated d.c. amplifier for pen-recorder, 1603
—— with R. H. Tizard, electronic speed control for carriage of ship-model testing tank, 418
Harrington, J. V., storage of small signals on dielectric surface, 787
—— and T. F. Rogers, signal/noise improvement by integration in storage tube, 732
—— K. N. Wulfsberg and G. R. Spencer, five-digit parallel coder tube, (A)2226
Harrington, R. F., and W. R. LePage, directional aerial arrays with elements circularly disposed about cylindrical reflector, (A)2100
Harris, C. M., and H. Feshbach, acoustics of coupled rooms, 15
Harris, E. J., electrometer impedance converter, 2117
—— with P. O. Bishop, d.c. amplifier for biological application, (C)818
Harris, H. C., a.m.-f.m. analogy, (A)2270
—— with H. R. Holloway, precision frequency generators using s.s.b. suppressed-carrier modulators, (A)2226
Harris, H. E., simplified *Q* multiplier, 2878
Harris, I. A., induced grid noise and noise factor, 1535
Harris, J. D., short-duration effects in auditory fatigue, (A)535
Harris, W. A., with others, design of mobile equipment for 152–174 Mc/s, 988, 1762
Hart, H., G. Schaffstein and G. Vogt, development of commercial receivers, 2529
Hart, R. W., sound scattering of plane wave from sphere, 2317
—— and E. W. Montroll, scattering of plane waves by 'soft' spherical obstacles, 2139
Hartree, D. R., Calculating Instruments and Machines, (B)936
Harvard University. Computation Laboratory, Tables of the Function Sin φ/φ and of its First Eleven Derivatives, (B)1701
Harvey, F. K., with W. E. Kock, photographic method for displaying sound-wave space patterns, (A)1811
Harvey, N. L., new basis for analysis of radar systems, 357
—— M. Leifer and N. Marchand, component theory of calculating radio spectra, 2834
Harvey, R. L., I. J. Hegyi and H. W. Leverenz, structure, properties and uses of ferrites, 368
Harrison, R. E., voltage stabilizers using two valves in parallel, 1252
Harwood, H. D., and D. E. L. Shorter, high-level noise source for a.f. band, 25
Haskell, N. A., asymptotic approximation for normal modes in sound-channel wave propagation, 1543
Haskins, J. F., and J. S. Hickman, piezoelectric equations of state, 98
Hässler, G., f.m. in line transmission, 1485
Hasted, J. B., G. H. Haggis and P. Hutton, dielectric dispersion of dioxan-water mixtures, 3027
Hatfield, P., ultrasonic propagation in rubbers, 270
Hathaway, J. L., a.f. a.g.c. for broadcasting transmitters, 318
—— and R. C. Kennedy, brief-case a.f. amplifier, 312
Hatkin, L., elliptically polarized waves, (D)1074
Hattiangadi, M. S., with M. W. Chiplonkar, reflection of atmospherics from ionosphere, 2184, 2185
Hauer, A., meteorological aspects of very-short-wave propagation, 1998
Hauffe, K., lattice-imperfection phenomena in mixed phases, 2197
Haug, A., u.s.w. resonance method of impedance measurement, 694; u.s.w. resonance phenomena in low-pressure Hg arcs, 615
Haviland, R. P., amateur receiver for c.w., a.m., f.m., p.m., and s.s.b. with carrier suppression, 439
Hawkins, G. S., with others, radio echo equipment for determination of meteor radiants, 3003
Hawley, M. E., and A. H. Kettler, higher-order-gradient microphones, using single diaphragm, (A)1811
Hawthorne, E. I., sinusoidal variation of inductance in linear series RLC circuit, 1330
Haxel, O., F. G. Houtermans and K. Seegar, electron emission from metal surfaces as after effect, 3151
Haynes, J. R., and W. Shockley, mobility and life of injected holes and electrons in Ge, 1928
Hazard, C., with R. H. Brown, r.f. radiation from Andromeda nebula, 629
Heacock, D. P., and R. A. Wissolik, low-noise miniature pentode, 2063
Heaps, C. W., magnetoresistance of Bi at 3 kMc/s, 1165
Heaton, V. E., measurement of time and frequency in Hawaii, 2225
Heaviside, O., Electromagnetic Theory, Vols. 1, 2 and 3, (B)628
Hegyi, I. J., with others, structure, properties and uses of ferrites, 368
Hehenkamp, T., with H. C. Hamaker, minimum-cost transformers and chokes, 1853, 2931
Heightman, D. W., communication receiver design, 2004; propagation of metre waves beyond optical range, 431
Heins, A. E., reflection of plane e.m. wave by infinite set of plates, 1352
Heiser, W., with B. Amos, internal television receiver interference, (A)2292
Helbig, H., review of semiconductor photoresistance cells, 2960
Hellar, R. A., with E. G. Widell, effect of coating composition on emission of oxide-coated cathodes, 1025
Heller, B., J. Hlávka and A. Veverka, natural frequencies of single-layer solenoids subjected to voltage surges, 1099
Heller, G. S., with others, underwater sound field of quartz transducers, 1821
Heller, S., and I. Shulman, Television Servicing, (B)495
Helliwell, R. A., A. J. Mallinckrodt and F. W. Kruse, Jr, fine structure of lower ionosphere, 1898
—— and others, measurement of polarization of l.f. ionosphere reflections, (A)2799
Hellyar, P. R., design of a.m. broadcasting transmitters for Australia, 766
Helmes, E., design of magnetic-amplifier inductors, 2361
Helt, S., Practical Television Engineering, (B)1011
Helwig, G., with H. König, thin film of hydrocarbon formed by electron or ion bombardment, 2738
Hémardinquer, P., 200-kV e.s. generators, 999
Heney, J., with others, magneto-optics of electron gas with guided microwaves, 2911
Henisch, H. K., and J. Ewels, electrical forming effects at Se contacts, 926, (D)1943
Henney, K., Radio Engineering Handbook, (B)1289
Henninger, P., properties of liquid dielectrics with polar components, 686
Henrici, P., calculation of eigenvalues of matrices by punched-card machines, 1175
Henry, J., horizontal-deflection system and h.v. supply, 3129
Henry, R. L., R. K. F. Scal and G. Shapiro, new techniques for miniaturization, 307
Henry, W. H., and J. D. Keys, pulser for cyclotron oscillator, 2855
Hensley, E. B., and J. H. Affleck, BaO-on-W cathode interface compound, 263, 2064
Hentsch, J. C., precision method for a.f. measurement, 3050; transient reproduction by loudspeakers, 2898
Heppel, H. K., with others, dielectric properties of Cu_2O rectifiers, 925
Hergenrother, R. C., and B. C. Gardner, recording storage tube, (C)788, (C)3181
Herman, F., with A. R. Moore, electron-bombardment-induced conductivity in Ge rectifiers, 1685
Hernqvist, K. G., with E. G. Linder, reduction of space-charge effects in electron beams, 1013
Herr, R., ferrites for magnetic recording heads, 2445
Herreng, P., with others, compressor/expandor units of French P.T.T., 996
Herrick, J. F., with others, heating of bone and bone marrow by ultrasonic radiation, (A)527
Herrmann, G., and S. Wagener, Die Oxydkathode, 2. Teil, Technik und

[illegible]
Herzing, A., metal location by measurement of small variations of L and C, 1197
Hertz, H., magnetic scaling-down circuit, 1318
Herzog, W., effect of circuit capacitances on filter attenuation curves, 1327; oscillators, 2675; pull-in effect in coupled circuits, 2674
Hess, K. W., deionization time of gas-filled valves, 2061
Hess, V. F., and R. P. Vancour, ionization of atmosphere, 894
Hess, W. B., R. C. Swengel and S. K. Waldorf, ultrasonic measurement of water velocity, 416
Hessler, V. P., and D. D. Robb, generalized electrical formulae, 2405
Hettich, H., with R. Feldtkeller, variation of magnetic after-effect in powder cores, 2446
Heumann, H., with W. Claussnitzer, plotting of electric fields, using semiconducting paper, 1427
Hewish, A., with M. Ryle, effects of ionosphere on r.f. galactic radiation, 1584
Hewitt, F. J., testing Mark V Decca navigator receiver in high noise levels, 3062
Heyn, F. A., synchrocyclotron at Amsterdam, 2790
Heywang, W., effect of lattice irregularities on semiconductor resistance, 911
Hibbard, L. U., Birmingham University proton synchrotron, 700
Hibi, T., and T. Matsumura, aggregation of trapping centres in semiconductors, 1926
Hickman, J. S., with J. F. Haskins, piezoelectric equations of state, 98
Hickman, R. B., American television film recording equipment, 2555
Hickman, R. E. B., multiplier photocells in scintillation counters, 1016
Hieble, M. E., engineering supergain television aerial, 2918
Hiestand, N. P., with others, crystal control of 4-kW 1036-Mc/s transmitter, (A)2298
Higgins, T. J., basic theory of generalized Schwartz-Christoffel transformation, 1951
—— and G. Robertson, theory of moving-coil fluxmeter, 944
—— with J. van Bladel, cut-off frequency for two-dielectric rectangular waveguides, 1841
—— with D. K. Reitan, calculation of capacitance of cube, 1623
Hilburn, E. D., video distribution system, 1790
Hill, J. S., and G. V. Waldo, v.h.f. tropospheric measurements, (A)2799
Hill, R. T., with L. S. Allard, switch and storage tubes, 3180
Hill, W. R., Electronics in Engineering, (B)426
Hillert, M., time dependence of sensitivity of photomultipliers, 3155
Hillier, J., intermediate lens for increasing magnification range of electron microscope, 185; objective for electron microscopy of ultrathin sections, 1740
Hills, R., Jr, synthesis of line-source directivity pattern, (A)1811
Himpan, J., deflection of extended electronoptical image by crossed systems, 2503
Hindman, J. V., with W. N. Christiansen, long-period change in r.f. solar radiation at dm λ, 2171
—— with J. H. Piddington, solar radiaton at 10 cm during eclipse, 347
—— with others, radio observations of two large solar disturbances, 2168
Hines, C. O., e.m. energy density and flux, (A)2799; wave packets, Poynting vector, and energy flow, 1881, 2696, 2697
Hines, M. E., wide-range microwave sweeping oscillator, 412
Hintenberger, H., second-order focusing of charged particles in magnetic fields, 184
von Hippel, A. R., dielectrics made to order, 2746
—— and M. C. Bloom, selenium electroplating, 671
Hirsch, C. J., with A. V. Loughren, comparative analysis of colour-television systems, 1786
Hlavka, J., with others, natural frequencies of single-layer solenoids subjected to voltage surges 1099
Hoagland, K. A., picture-tube performance, 2852
Hochrainer, A., with A. Duschek, Grundzüge der Tensorrechnung in analytischer Darstellung, Teil I, Tensoralgebra, (B)388
Hodge, M. W., with O. R. Wulf, relation between geomagnetic field and circulation of atmosphere, 1369
Hoeppner, C. H., telemetry and guided-missile programme, (A)2245
Hoffmann, A., rectifiers, Se, Tl-containing, forming processes in, 1170, dry, oscillographic study of barrier layers, 941
de Hoffmann, F., and E. Teller, magneto-hydrodynamic shock waves, 605
Hogan, A. W., image-converter tube for high-speed photography, 2250, 3080
Hogan, J. V. L., and C. V. Olson, high-speed f.m. facsimile, 461
Hogarth, C. A., Hall constant of CdO, 1678
Hogarth, J. E., angle of arrival and polarization at Fort Chimo, (A)2799; polarization of Z-trace, 3090
Hogben, H. E., marine radio position fixing systems, 2188
Hogg, D., l.f. atmospherics in South Africa, 438
Hoinkes, H., pressure and temperature variations in troposphere, 875
Hok, G., with others, single-cavity resonator for multianode magnetron, (A)2304
Holland, J. D., design of radiotelegraph receiving system, 2822
Hollmann, H. E., travelling-wave c.r. tube, (D)2048
Holloway, H. R., and H. C. Harris, precision frequency generators using s.s.b. suppressed-carrier modulators, (A)2226
—— with others, analysis of dot-sequential colour television, 465
Holm, R., tunnel effect across thin insulator films in contacts, 2455
Holmboe, L. W., with others, back heating of magnetron cathodes, 789
Holmes, F. C., unsaturated standard cells, 2287
Holshouser, D. F., with others, beam analyser, (A)2226
Honerjäger, R., microwave spectroscopy, 2161
Honnell, M. A., and M. D. Prince, v.m. in television image reproduction, 2296
Hooper, J. E. N., and A. A. Kippax, radar echoes from rain, (D)1155
Hopkins, E. G., beam-deflection phase-modulator valve, 1805
Hopkins, H. G., with J. A. Saxton, adverse effects of meteorological factors on marine radar equipment, 1228
Hopkinson, R. G., R. B. Mackenzie and R. D. Nixon, pictorial reproduction in television, 2029
Hopper, A. L., storing video information, 2842
Horner, F., accuracy of aural-null direction-finder, 119
Hort, W., and A. Thoma, Die Differentialgleichungen der Technik und Physik, (B)148
Horton, C. W., semiconductor bornite, 1930; table of Struve functions and associated integrals, 140
—— and F. C. Karal, Jr, diffraction by paraboloid, of plane e.m. wave, 2413, of plane sound wave, 1047
—— F. C. Karal, Jr, and C. M. McKinney, radiation patterns of dielectric rods in TM$_{01}$ mode, 1075
Hoselitz, K., and M. McCaig, theory of magnetic properties of anisotropic alloys, 658
Hoshino, S., with others, X-ray study of phase transition in PbTiO$_3$, 927
Hough, G. H., and D. S. Ridler, multicathode gas-filled counter tubes, 784
Houtermans, F. G., with others, electron emission from metal surfaces as after effect, 3151
Houtsmuller, J., change in m.w. propagation at sunset, 2809
Howard, L. W., use of Ni steels in low-power transformers, 289
Howell, F. S., experimental results of c.w. navigation systems, 3006
Hoy, N. A., with others, effect of radiation on Q of sections of unshielded parallel-wire transmission line, (A)2100
Hsiung Hsu, effect of secondary emission in power valves, (A)2304
Hubbard, J. C., with others, high-intensity-spark light source, 1222
Huber, L., and K. Rawer, 'best' pulse receiver, 1866
Huber, O., determining dielectric constants of liquids in dm waveband, 3046
Hübner, W., calibration of distortion-factor bridge, 164
Hudack, J. M., automatic transmission-measurement set, 1194
Hudson, C. S., theory of series transductor, 1095
Hugenholtz, E. H., impulse-controlled oscillators in aircraft transmitters, 767
Huggins, W. H., system-function analysis of speech sounds, 1059
Hughes, H. A., electrometer-valve balanced circuits, 3051
Hughes, J. V., and W. Lavrench, permittivity of air at λ 10 cm, 3047
Hull, A. W., fundamental processes in gas-filled rectifier valves, 258
Hull, T. E., with L. Infeld, factorization method, 2216
Hulm, J. K., with B. T. Matthias, new ferroelectric tartrates, 2208
Hungermann, E. H., physics and technology of transistors, 1802
Hunt, F. V., symmetry in equations for electromechanical coupling, (A)554
Hunter, L. P., graphical analysis for transistor circuits, 1101; inverse-voltage characteristic of point contact on n-type Ge, 1530
—— and R. E. Brown, test equipment for transistors, 398
—— with A. I. Bennett, pulse measurement of inverse-voltage characteristics of Ge point contacts, 1531
—— with C. N. Klahr, measurement of semiconductor impurity content, 1927
Hunter, W. C., with others, 6-channel mobile urban R/T system, 741
Hurford, W. L., television waveform monitor frequency response, 2475
Hurty, W. C., with T. A. Rogers, shunt-motor servo with inertia load, 1249
Husten, B. F., improved N.B.S. ammonia clock, (A)1958
Hutner, R. A., E. S. Rittner and F. K. du Pré, Fermi levels in semiconductors, 906
Hutter, R. G. E., with others, rotating-beam method for investigating electron lenses, (A)2245
Hüttmann, E., nonlinear distortion in electroacoustic transducers, 1558; quality rating of dynamic cone loudspeakers, 2093
Hutton, P., with others, dielectric dispersion of dioxan-water mixtures, 3027
Huynen, J. R., radar aerial systems for uniform irradiation of surface, 117
Hyde, F. J., with others, measurement of gyrointeraction, 155

I

Ihde, W. M., with others, apparatus for acoustic impedance measurement, (A)534
Indjoudjian, M. D., conference on information theory, 2011
Infeld, L., and T. E. Hull, factorization method, 2216
Ingård, U., reflection of spherical sound wave from infinite plane, 2318
—— and others, design of sound-absorbing ducts, (A)1811
Ingerson, W. E., drift compensation in d.c. amplifiers for analogue computers, (A)2220
Ingham, W. E., ignition interference in p.w.m., 761
Inglis, A. F., with F. H. McIntosh, colour television, 1003
Insch, G. M., calibration of proportional counters, 713
Isberg, R. A., economy and operating efficiency of television stations, (A)2292
Israel, H., semidiurnal fluctuations of atmospheric potential gradient, 1906
Ivey, H. F., and C. L. Shackelford, thermionic emission calculations, 1877

J

Jackel, R. D., progress in synthetic mica, 1946
Jackson, C. H., electronics in air transport, 2434
Jackson, W., information theory, 984; structure, properties and applications of BaTiO$_3$ ceramics, 133; sudden commencements in geomagnetism, 352
Jacob, H., with H. Falkenhagen, theory of electrostriction in Onsager liquids, 2141
Jacob, L., crossover properties of electron immersion objective, 785
Jacobs, J. E., and R. F. Wilson, X-ray liquid-level gauge, (A)2945
Jacobs, R. B., design of molecular pumps, 1661
Jacobson, H., information and human ear, 2618
Jacquinot, P., with others, evaporation in vacuo by direct bombardment, 3029
Jaeger, J. C., and K. C. Westfold, equivalent path and absorption for e.m. radiation in solar corona, 1628
Jager, J., with P. D. van der Knaap, deflection coils for television receivers high-impedance type, 2295, low-impedance type, 1798
Jahn, H., with H. Etzold, sensitivity limit of mains-driven d.c. amplifiers, 1602
Jakes, W. C., Jr, gain of e.m. horns, 1847
—— with A. B. Crawford, selective fading of microwaves, (A)2263
James, E. G., with R. W. Douglas, crystal diodes, 2587
James, K., and R. T. Capodanno, permanent-magnet focusing for picture tubes, 2032
Janes, R. B., and A. A. Rotow, light-transfer characteristics of image orthicons, 481
Jansen, J. J., with others, biconical e.m. horns, (C)2345
Jansen, M. J., with others, L-type heavy-duty thermionic cathodes, 778
Janssen, E., and D. Lebell, applications of differential analyser to electrical engineering, 3037
Janssen, J. M. L., c.r.o. for h.f. periodic phenomena, 949; method of discontinuities in Fourier analysis, 2215; 'stroboscopic' c.r.o. for frequencies up to 50 Mc/s, 1434
—— and L. Ensing, electro-analogue for studying regulating systems, 2782
—— and A. J. Michels, 'stroboscopic' oscilloscope for frequencies up to 50 Mc/s, 1435
Jasberg, J., with others, design of 10^8-eV linear electron accelerator, (A)2245
Javitz, A. E., industrial applications of magnetic recording, 1560; research developments in dielectrics, 1405
Jenkins, R. O., end-window G-M counter tubes, 2258
Jennings, B., electronics and e.s. generator, 421
Jensen, A. S., with G. W. Gray, sequential operation of beam-deflection storage tubes, 1317
Jerome, C. W., with others, electroluminescence, new light source, 1341
Jerrard, H. G., and S. W. Punnett, electronic tachometer, 177
—— with S. W. Punnett, precision electronic tachometer, 1730
Jerrentrup, F., characteristics of rectifier disks, 2840
Jessel, M., diffractive apertures in waveguides, 2102
Job, F., with others, level regulation on Paris-Toulouse coaxial cable, 2832
Johannesson, N. O., wide-band 2-phase networks, (D)56
John, U., with F. A. Fischer, calculation of input impedance of coupled circuits, 2384
Johnson, B. R., with others, television synchronizing-signal generator, 749
Johnson, D. S., with F. E. Fowler, servo guider for solar telescopes, 2779
Johnson, E. O., controllable gas diode, 2869
—— and W. M. Webster, plasmatron continuously controllable gas tube, (A)2304
Johnson, H., frequency range of diode noise generators, 3060
Johnson, J. B., bombardment-enhanced thermionic emission, 3152
Johnson, J. R., with A. A. Ghirardi, Receiver Circuitry and Operation, (B)3104
Johnson, K. C., cm-wave discriminator and application to frequency-stabilized oscillator, 1596; 3-state flip-flop, (D)2937
Johnson, L. W., with others, timing unit and pulse deflector generator for synchrocyclotron, (A)2245
Johnson, P. D., and F. E. Williams, luminescence efficiency of organic solutions and crystals, 1396
Johnson, S. J., with T. F. Rogers, magnetic effects on Ni acoustic delay line, 642, (A)2100
Johnson, V. A., and K. Lark-Horovitz, combination of resistivities in semiconductors, 3015; electron mobility in Ge, 662
Johnson, W. C., Transmission Lines and Networks, (B)2355
Johnston, T. F., and F. D. Wertz, cylindrical BaTiO$_3$ transducers, (A)556
Jolivet, P., with L. Vérain, underwater gaussmeter, 158
Jolly, W. P., vacuum gauge using Pirani cooling of tungsten filament, (D)640
Jona, F., elasticity of piezoelectric and ferroelectric crystals, 1663
Jones, A. Taber, acoustics bibliography, 1, 1042, 1541, 1812
—— and R. T. Beyer, acoustics bibliography, 2309
Jones, D. S., diffraction by edge, 1619
Jones, E., S. Edelman and A. London, long-tube method for field determinations of sound-absorption coefficients, (A)548
—— with E. T. Emms, video output stage, 1268
Jones, F. L., and D. E. Davies, cathode surface layers and minimum sparking potential, 2973
—— E. T. de la Perrelle and C. G. Morgan, influence of electrodes in starting gas discharge, 1615
Jones, H., Hall coefficient for semiconductors, 1357
Jones, J. R., with H. J. Allcock, The Nomogram, (B)1423
Jones, J. Rhys, c.r. d.f. equipment, 896
Jones, R. C., speech silencer for radio receivers, (A)2265
Jones, R. V., radiation pressure in refracting medium, 1606
Jones, S. S. D., with J. Brown, microwave lenses, 36, (D)2924
Jonker, G. H., with J. H. van Santen, conductivity of ferromagnetic compounds of Mn, 656
Jonker, G. H., dielectric constant of inhomogeneous dielectrics, 890
Jonker, J. L. H., internal resistance of pentode, 865, 3179
—— with G. Diemer, time delay of secondary electron emission, 1014
Jordan, E. C., aerial systems for d.f., (A)2842
Josephs, H. J., Heaviside's Electric Circuit Theory, (B)321
Joy, J. E., with R. G. Picard, metal evaporator using h.f. heating, 2497
Jumau, L., recent patents on batteries, 233
Jupe, J. H., British developments in instrumentation, 391; measurement of small d.c., electronic temperature-control equipment, and Cossor extension unit for television, 1195; Schering bridge for voltages to 200 kV, 1716
—— with R. T. Lovelock, Ge diodes, 2059
Jutting, W. C. van B., radiospectroscope SFM101, 1964

K

Käch, A., cavity resonator as interstage transformer, 308
Kaden, H., circular-aperture and slot couplings between coaxial lines, 2111; Die elektromagnetische Schirmung in der Fernmelde- und Hochfrequenztechnik, (B)602
Kafka, H., conductance diagrams for passive linear quadripoles, 1324
Kahan, T., and G. Eckart, e.m. waves in atmospheric duct, Green's function for, 719, theory of propagation of, 1465; nonexistence of surface wave in radiation over plane earth, 2517
—— with G. Eckart, 'internal' reflection in stratified medium, and application to troposphere, 718
Kahn, D. A., analysis of relay servomechanisms, 992
Kahn, F. D., corpuscular streams from solar flares, expulsion of, 1888, possibility of observing, 1889
Kaisel, S. F., and J. W. Kearney, 2·6–4·0-kMc/s voltage-s.w.r. measurement set, (A)1958
Kaiser, H. R., with D. L. Gerlough, counter circuit with outputs at several predetermined counts, 1585
Kalashnikov, S. G., and L. N. Erastov, formation of barrier layers by welding, 2729
Kales, M. L., elliptically polarized waves and aerials, 2419
Kallen, R., apparatus for testing telephone earpieces, 2896
Kallman, H., with others, construction of radioactivity instruments, 3079
Kallmann, H. E., with others, millimicrosecond oscillography, 3054
Kalusche, H., unidirectional loudspeaker system, 555
Kamen, I., subtractive colour-television system, 1259
van Kampen, N. G., asymptotic treatment of diffraction, 2138
Kane, R. W., E. C. Levinthal and E. H. Rodgers, magnetic-field measuring instrument, (A)2226
—— with others, crystal control of 4-kW 1036-Mc/s transmitter, (A)2298
Känzig, W., X-ray investigations of ferroelectricity of BaTiO$_3$, 2448
Kaplan, J., with N. C. Gerson, nomenclature for upper atmosphere, (D)1643
Kaplan, S. M., and R. W. McFall, noise statistics applied to radar-range performance, 1390
Karakash, J., Transmission Lines and Filter Networks, (B)2925
Karal, F. C., Jr, with C. W. Horton, diffraction by paraboloid, of plane e.m. wave, 2413, of plane sound wave, 1047
—— with others, radiation patterns of dielectric rods in TM$_{01}$ mode, 1075
Karo, D., Electrical Measurements and the Calculation of the Errors Involved, (B)2490
Karr, P. R., radiation properties of spherical aerials, 2343
Kauke, J. R., p.w.m./f.m. telemetry, (A)2245
Kear, F. G., and O. B. Hanson, television aerials on Empire State Building, 1568
Kearney, J. W., with S. F. Kaisel, 2·6–4·0 kMc/s, voltage-s.w.r. measurement set, (A)1958
Keck, P. H., electrical properties of Se coatings, 1925
Keck, W., G. S. Heller and A. O. Williams, Jr, underwater sound field of quartz transducers, 1821
—— with A. O. Williams, Jr, effects of reflected signals and electric pickup in ultrasonic microphone, 1824
Kedesdy, H., with K. Lehovec, graphical determination of Fermi level in impurity semiconductor, 1343
Keen, A. W., correlation of circuit diagrams and wiring, 2379; triode transmission networks under linear negative-grid conditions, 1321
Kell, R. C., with others, growth of large quartz crystals, 3024
Kellaway, N. P., with F. E. Cone, test and alignment procedures for video amplifiers, 1201
Kelleher, K. S., microwave lenses, (D)2924; microwave optics, aperture phase errors in, (A)2642, virtual source in, (A)2100
—— with R. J. Adams, pattern calculations for paraboloid aerials of elliptic aperture, 39
Keller, H., piezoelectric crystals in flexural vibration, 2952
Keller, J. B., reflection and transmission of e.m. waves by thin curved shells, 93
—— and A. Blank, diffraction of pulses by wedges and corners, 2963
Kelly, J. M., magnetic field measurements with peaking strips, 2766
Kelly, M. J., Bell Telephone laboratories, 793; educational requirements for development engineers, (A)2308
Kelly, S., a.f. valve voltmeter, 2482; intermodulation distortion in pickups, 2621; thorn needles, (D)1831
—— with R. L. West, pickup-amplifier input circuits, 594
Kelso, J. M., Lorentz polarization term and ionospheric absorption, 2428
—— and H. J. Nearhoof, polarization of long waves reflected from ionosphere, (A)2799
Kemp, W. D., improved video recording with continuously moving film, 1006
Kendall, J. T., and D. Yeo, magnetic susceptibility and anisotropy of mica, 1687
Kendig, P. M., with D. T. Laird, attenuation of sound in water containing air bubbles, (A)1811
Kennaugh, E. M., polarization properties of target reflections, (A)2186
Kennedy, R. C., with G. L. Fredendall, linear-phase-shift video filters, 303
—— with J. L. Hathaway, brief-case a.f. amplifier, 312
Kent, C. F., and J. E. Boyd, probability distributions of resultants of two or more vibrations, (A)678
Kent, G. J., production-line frequency measurements, 1721
Kenyon, R. R., response characteristics of RX ladder networks, 2374
Kerchner, R. M., and G. F. Corcoran, Alternating Current Circuits, (B)2396
Kerns, D. M., analysis of symmetrical waveguide junctions, 2101
—— with A. C. Macpherson, absolute microwave power measurements, (A)1958
Kerr, F. J., and C. A. Shain, moon echoes and transmission through ionosphere, 2264
Kesselring, F., new types of high-power rectifiers, 225
Kessler, W. J., atmospherics waveform receiver, 2717; effective and circuit bandwidths, 55
—— and W. F. Zetrouer II, l.f. ionosphere soundings by observation of atmospherics, (A)2263
Kettel, E., nonlinear distortion in f.m. systems, 2835
Kettler, A. H., with M. E. Hawley, higher-order-gradient microphones using single diaphragm, (A)1811
de Keuster, A., with F. P. Pietermaat, dielectric properties of diamond, 2210
Keys, J. D., with W. H. Henry, pulser for cyclotron oscillator, 2255
Khastgir, S. R., and P. M. Das, periodic fading of s.w. signals, 981
—— and A. Sen, frequency variation of intensity of atmospherics from distant sources, 1387
Khodakov, A. L., h.f. losses in ceramic dielectrics and in BaTiO$_3$, 2458
Kiebert, M. V., Jr, f.m./f.m. telemetry, (A)2245
Kieffer, J., with G. Trébuchon, physics of glass/metal sealing, 135, 989, 2461
Kiely, D. G., dielectric aerials with shaped radiation patterns, 2921; parabolic-cylinder aerials, 1578; radiation characteristics of dielectric-tube aerials, 38
—— and A. E. Collins, microwave-aerial radiation patterns, 1077
—— A. E. Collins and G. S. Evans, cheese aerials for marine navigational radar, 1086
Kilburn, T., with F. C. Williams, storage system for binary-digital computers, (D)680
—— with others, small-scale experimental high-speed digital computer, 1952
Kilpatrick, E. L., polarization measurements of l.f. echoes, (A)2799
Kimbark, E. W., Electrical Transmission of Power and Signals, (B)2076
Kimura, M., temperature effect in G-M counters, 714
Kincaid, M., J. M. Alden and R. B. Hanna, static magnetic memory unit for low-cost computers, 1422
Kinner, E., and F. Schleich, constant-current mains unit for electron-

microscope lenses, **746**
King, A. P., transmission characteristics of multimode circular waveguide, **(A)2100**
King, D. D., two standard field-strength meters for v.h.f., **154**
King, R., aerials, asymmetrically driven, and sleeve dipole, **296**, collinear, theory of, **1073**
—— with C. H. Papas, radiation from wide-angle conical aerials, **1307**
Kinross, R. I., television and sound by wire, **2277**
Kinsler, L. E., and A. R. Frey, Fundamentals of Acoustics, **(B)1561**
Kippax, A. A., with J. E. N. Hooper, radar echoes from rain, **(D)1155**
Kirby, M. J., servomechanisms with linearly varying elements, **(A)2547**
Kirby, R. S., field-strength measurements for two v.h.f. stations, **(A)2799**
Kircher, R. J., with others, 1·5-kW 500-Mc/s grounded-grid triode, **3178**
Kirchmayer, L. K., with others, special devices for differential analysers, **(A)1183**
Kirchner, F., h.f. gas discharge, **85**
Kirenski, L. V., and L. I. Slobodskoi, effect of directed stresses on shape of magnetization curve, **2408**
Kirschbaum, H. S., and C. E. Warren, design of pulse transformers, **828**
Kirschner, U., generalized network theory, **837**; representation of valve circuit by iterative matrix, **2666**
Kitai, R., valve voltmeter for students' use, **400**
Kitchenn, R. C., double-tuned transformers in tandem, **2929**
Kittel, C., E. A. Nesbitt and W. Shockley, nucleation and magnetic properties of alnico V, **657**
—— with others, velocity of propagation of ferromagnetic domain boundary, **855**
Klahr, C. N., resistivity and Hall coefficient of semiconductors, **(D)2206**
—— and L. P. Hunter, measurement of semiconductor impurity content, **1927**
Klair, J., with others, bibliography of sonic and ultrasonic applications in biology, biochemistry and biophysics, **1813**
Klauss, E., with B. D. H. Tellegen, parameters of passive 'gyrator' quadripole, **301**; resonant circuits coupled by quadripole, **2945**
Kleen, W., receiver noise, **2532**
—— with others, electron beams and e.m. waves, **3166**
Kleijnen, P. H. J. A., penetration factor and field of planar triode, **3176**
Klein, M. J., and R. S. Smith, thin ferromagnetic films, **1675**
Klein, P. E., electron-beam 'ferroscope', **2477**
Klein, W., u.h.f. R/T transmission tests in Alps, **219**
Kleinwächter, H., travelling-wave valves, **502**
Klemperer, H., developments in signal-storage tubes, **1536**
—— with others, e.s. storage tube, **1034**
Klemperer, O., and Y. Klinger, spherical aberration of electron-emission systems, **1977**
Klick, C. C., and J. H. Schulman, 'sub-bands' in luminescence spectrum of Zn_2SiO_4-Mn, **647**
—— with J. H. Schulman, fluorescence of phosphorescence emission spectra of Zn_2SiO_4-Mn, **367**
Kline, M., asymptotic solution of Maxwell's equation, **(A)2752**
Klingaman, G. W., reduction of interference from r.f. heating equipment, **206**
Klinger, H. H., new travelling-wave valves, **2865**
Klinger, Y., with O. Klemperer, spherical aberration of electron-emission systems, **1977**
Klute, W. A., microwave pulse generation and shaping, **3111**
van der Knaap, P. D., and J. Jager, deflection coils for television receivers, high-impedance type, **2295**, low-impedance type, **1793**
—— with others, electrical recording of diagrams with systems of coordinates, **3075**
Knight, H. de B., characteristics of hot-cathode thyratrons, **(D)782**
Knighting, E., meteorological aspects of radio-duct formation, **1466**
Knol, K. S., and G. Diemer, e.m. waves in waveguides, **565**; fluctuations and damping in double-cathode valves, **507**, **(C)3175**
—— with G. Diemer, low-level triode amplifier for microwaves, **780**
Knoll, M., and J. Randmer, grid-type image-storage c.r. tube, **786**
—— with others, getter materials for valves, **499**
Knudsen, H. L., field of circular and square helical aerials, **1844**; solution of system of linear equations with asymmetrical matrix, **2469**
Kobrak, H. G., effects of high-intensity sounds in ear, **(A)537**
Kobrynski, M., and A. Neyron, measurement of sound transmission through partitions, **2616**
Koch, B., and H. Neuert, random electron oscillations in h.f. gas discharge in magnetic field, **614**
Kochenburger, J., analysis of contactor servomechanisms by frequency-response methods, **224**
Kock, W. E., photographic techniques for microwave field patterns, **(A)1958**
—— and F. K. Harvey, photographic method for displaying sound-wave space patterns, **(A)1811**
Koenig, E. C., photoelectric analogue computer, **1187**
Koerner, L. F., crystal units, measurement of characteristics of, **(A)1958**, test oscillators for, **1437**
Kofink, W., with others, bolometer with short time-lag, **3059**
Kogan, S. Kh., e.m. wave propagation along endless solenoid, **30**
Kojima, S., and K. Takayama, noise temperature of d.c. gas-discharge plasma, **1133**
Kolb, O. K., magnetic-sound-film developments in Great Britain, **1065**
Kollath, R., direction and phase in particle accelerators, **1447**
Kolomiets, B. T., characteristics of PbS photoresistors, **2862**
Kondorski, E., single-domain structure in ferromagnetics, **2406**
König, H., schlieren optics in electron microscope, **1451**
—— and G. Helwig, thin films of hydrocarbon formed by electron or ion bombardment, **2738**
König, H. W., dynamic electron flow under influence of dynamic field, **854**
Koppenhöfer, A., with M. Krüger, r.f. induction heating of metals, **2786**
Korablev, L. N., ring counter using neon lamps, **2120**
Korff, S. A., and Y. Beers, solar atmosphere and origin of r.f. radiation, **341**
Korman, N. I., and J. R. Ford, achromatic microwave aerial, **(D)1078**
Korn, G. A., and T. M. Korn, modern servomechanism testers, **457**
Korn, T. M., with G. A. Korn, modern servomechanism testers, **457**
Kornetzki, M., measurements on high-μ ferrite cores, **2736**; permittivity of $BaTiO_3$, **1404**; relation between permittivity and loss angle of ferroelectric materials, **1402**
—— and J. Brackmann, cores for u.s.w. variometers, **1677**
Kornhauser, E. T., propagation on dielectric-coated wires, **(D)2098**
Koros, L. L., and R. F. Schwartz, transistor frequency-modulator circuit, **3147**
Kortman, C. M., with J. M. Shaull, chronograph and chronoscope for comparison of quartz clocks, **2471**
Kosmahl, H., with R. Gebauer, efficiency of oscillation generation in v.m. valves, **2602**
Kosten, L., design and construction of electronic computers, **1181**
Kotowski, P., and H. Sobotka, Drahtloser Überseeverkehr, **(B)2283**
—— E. Schüttlöffel and G. Vogt, directive aerials for s.w. angle-of-incidence measurements, **434**
Kouvelites, J. S., and L. W. McKeehan, magnetostriction of prolate spheroids, **1873**
Kraft, H., with others, u.s.w. transmitting valves, **2872**
Kraft, L. G., correlation function analysis, **1179**
—— with Y. W. Lee, detection of repetitive signals in noise by correlation, **(A)2265**
Krasnogorskaya, N. V., electron-multiplier magnetometer, **2765**
Krasnushkin, P. E., theory of oscillations in nonhomogeneous discrete structures, [illegible]
Kraus, J. D., Antennas, **(B)1574**; helix theorem, **2342**
Krause, R., determination of ultrasonic fields in fluids, **796**
Krauss, H. L., with P. F. Ordung, cathode-coupled-clipper response, **(A)2122**; frequency-coordinate vector diagram, **1578**
Krautkrämer, H., and J. Krautkrämer, testing materials by ultrasonic means, **3071**
Krautkrämer, J., with H. Krautkrämer, testing materials by ultrasonic means, **3071**
Krautz, E., properties of phosphors and photoconductors in intense electric fields, **902**
Krebs, K., pendular secondary-electron multiplication in h.f. fields, **790**
Kresser, J. V., with others, power-line carrier system for multistation control, telemetry and communication, **425**
Kretsch, H. W., and F. J. Walker, speed-controlled switch, **2936**
Kretzmer, E. R., application of autocorrelation analysis to p.t.m. systems, **1457**
Kritz, J., precision a.f. phase meter, **409**
Kroebel, W., measurement apparatus with frequency-sweep oscillator, **3049**; noise in undirectional conductors, **1406**
Kröger, F. A., and W. de Groot, effect of temperature on fluorescence of solids, **903**
—— with A. Bril, fluorescence saturation in television c.r. tubes, **1923**
Kroll, C. W., computation of geodetic distance from shoran observations, **898**
Kronenberger, K., fluctuation phenomena and operation of d.c. amplifier, **2879**
Kropp, R., power supplies for large transmitters, **2550**
Krüger, M., and A. Koppenhöfer, r.f. induction heating of metals, **2786**
Kruse, F. W., Jr, with others, fine structure of lower ionosphere, **1898**
Kryder, S. J., with others, microwave measurements of dielectric properties of gases, **1426**; recording atmospheric refractive index for microwaves, **(A)1958**
Kuehn, R. L., and R. K. Seigle, rack-mounted flying-spot scanner, **2846**
Kuentz, W., stratovision in Swiss territory, **3125**
Kundu, P., RC-tuned oscillators, **2955**
Kunz, K. S., propagation of microwaves between parallel conducting surfaces, **(A)2100**
Kupperian, J. E., Jr, P. C. Murray and H. Feeny, spurious counts in G-M counters, **1990**
Kuritsyna, E. F., with R. V. Telesnin, dependence of magnetic viscosity on temperature, **2410**
Kurss, H., with A. A. Oliner, measurement of equivalent circuit parameters of dissipative microwave structures, **(A)2100**
Kwal, B., consequences of radiation from fast particles in magnetic field, **1346**; correlation between cosmic rays and radio noise from sun and galaxy, **1142**; e.m. radiation from cosmic protons in intense magnetic fields, **2166**
Kyhl, R., with others, design of 10^9-eV linear electron accelerator, **(A)2245**

L

Labate, S., with others, design of sound-absorbing ducts, **(A)1811**
LaBerge, W. B., with others, Schottky effect for polished Ta, **1931**
Labeyrie, J., G-M counters, improved, CO_2-filled, **2259**, for ultraviolet radiation, **3085**
—— and P. Léger, glass/mica vacuum-tight seals, **2462**
Labin, É., Calcul Opérationnel, **(B)389**; signal-retardation electron tubes with delay modulation, **2576**; wide-band television systems, **475**
Labrum, N. R., with H. C. Minnett, solar radiation at 3·18-cm λ, **343**
Labus, J., bridge-compensated differential amplifiers, **2394**; h.f. amplification by interaction of two electron beams, **1018**; space-charge effects in h.f. modulated electron streams, **3167**; space charge and phase focusing of electron beams, **(D)3187**
Lacy, L. Y., with A. J. Aikens, 450-Mc/s R/T transmission tests in New York, **734**, **1766**
Ladner, A. W., and C. R. Stoner, Short Wave Wireless Communication, [illegible]
Laemmel, A. E., coding processes for bandwidth reduction in picture transmission, **(A)2270**; measurement of waveguide and coaxial-line impedances with circular waveguide, **(A)1958**
Laett, H., C.C.I.R. 625-line television standards, **3133**
Lafarque, C., with L. Godard, measurement of charges on particles of mist or rain, **355**
Lafferty, J. M., boride cathodes, **2050**
Laffineur, M., and C. Pecker, r.f. emission due to gyromagnetic effect in discharge, **1139**
Lagarde, M., P. Herreng and A. Gauvenet, compressor/expander units of French P.T.T., **306**
Lagasse, J., determination of leakage reactance of transformers, **1314**
LaGrone, A. H., W. H. Benson, Jr, and A. W. Straiton, attenuation of radio signals by scattering, **2525**
Laird, D. T., and P. M. Kendig, attenuation of sound in water containing air bubbles, **(A)1811**
Lakatos, E., problem solving with analogue computer, **1954**
Lallemand, A., development of ériscope, **478**
—— and M. Duchesne, properties of complex photoelectric layers, **1272**
Lambert, R. F., wall viscosity and heat conduction losses in rigid tubes, **2615**
Lampert, M., with others, magneto-optics of electron gas with guided microwaves, **2911**
Lance, T. M. C., improvements in large-screen television projection, **467**
Lanczos, C., iteration method for solution of eigenvalue problems of linear differential and integral operators, **1418**
Landauer, R., approximations for associated Legendre polynomials, **1415**
Landsberg, P. T., characteristics of Se photocells, **1513**; rectifiers, barrier-layer, theory of, **2744**, d.c. characteristics of, theory of, **2743**
—— R. W. Mackay and A. D. McRonald, parameters of simple excess semiconductors, **3014**
Landshoff, R., convergence of Chapman-Enskog method for ionized gas, **(D)2404**
Lang, Chi-Shi, with others, electron voltaic effect, **2303**
Lange, F., with H. Geschka, styroflex capacitors, properties and applications, **2121**
de Lange Dzn, H., calculation of multivibrator time delay, **72**
Lange, M., photoelectric scanning and chromatic selection for colour designs, **1258**
Langenhop, C. E., note on Levinson's existence theorem, **(D)3036**
Langille, R. C., scattering of 10-cm radio waves by rain, **1385**
Lankester, S. G., and S. G. Dreier, radio control for ship models, **1747**
Lanzalotti, S. J., with S. F. Danko, assembly of miniature military equipment, **2949**
Laporte, H., Die Messung von elektrischen Schwingungen aller Art nach Frequenz und Amplitude, **(B)2238**; Die Messung von elektrischen Spannungen und Strömen aller Art vom Gleichstrom bis zur Hochfrequenz, **(B)2239**
Lappe, F., and K. B. Westendorf, resistor for h.f. measurements, **2759**
Larach, S., and R. E. Shrader, cathodoluminescence of Zn_2SiO_4-Mn, **1921**
Lark-Horovitz, K., with V. A. Johnson, combination of resistivities in semiconductors, **3015**; electron mobility in Ge, **662**
Larson, R. R., with others, recording atmospheric refractive index for microwaves, **(A)1958**
Lashkarev, V. A., diffusion of current carriers in semiconductors, **2440**
Latimer, K. E., and H. B. MacDonald, possible applications of ferrites, **1934**
Laufer, A. R., ultrasonic generators and applications, **1976**
Lauter, E. A., statistics of night-time abnormal-E layer, **1377**
—— with F. Schindelhauer, phenomena connected with Mögel-Dellinger effects, **1477**
Lauterjung, K. H., current integrators for counters, **1462**
Laverick, E., special waveforms in study of dielectrics, **2230**
Lavrench, W., with J. V. Hughes, permittivity of air at λ 10 cm, **3047**
Lawson, J. D., with others, design of electron synchrotrons, **1212**
Lawson, J. L., and G. E. Uhlenbeck, Threshold Signals, Radiation Laboratory Series Vol. 24, **(B)1234**
Lax, B., W. P. Allis and S. C. Brown, effect of magnetic field on breakdown of gases at u.h.f., **1184**
Lax, M., with A. Levitas, scattering and absorption by acoustic strip, **2314**
Lazecki, S., with G. Glinski, plug-in units for digital computers, **(A)2220**
Lazzeri, J., 3-cm magnetrons, **2066**
Learned, V., klystron mixer applied to television relaying, **256**, **3146**
Lebacqz, J. V., with W. B. Sell, microwave oscillograph, **(A)1958**
Lebell, D., with C. K. Hadlock, studies of pulse-transformer equivalent circuits, **1313**
—— with E. Janssen, applications of differential analyser to electrical engineering, **3037**
Lebert, A. W., pulse testing of coaxial cables, **2231**
Lecuir, R., physico-chemical phenomena in ceramics industry, **2457**
Ledinegg, E., and P. Urban, theory of oscillations in coupled cavity resonators, **1115**
Ledward, T. A., barrier-layer photocells for high-impedance voltmeter, **401**
Lee, A. J., with A. C. Burd, sonic scattering layers in sea, **2083**
Lee, F. B., economics and choice of traffic-control system, **(A)2186**
Lee, R. W., with R. L. Garman, proposed closed-loop theatre television system, **3132**; television image tubes and techniques for films, **1792**
Lee, Y. W., and L. G. Kraft, detection of repetitive signals in noise by correlation, **(A)2265**
—— and J. B. Wiesner, correlation functions and application to communication problems, **(A)679**
—— T. P. Cheatham, Jr, and J. B. Wiesner, application of correlation analysis to reception of periodic signals in noise, **730**
Leeds, L. M., automatic television-synchronization lock, **3134**
v. Leeuwen, F. J., automatic apparatus for reverberation-time measurement, **1830**
Léger, P., with J. Labeyrie, glass/mica vacuum-tight seals, **2462**
Legg, V. E., with others, d.c. amplifiers using magnettors, **(A)2122**
Le Grand, Y., physiological basis of colour television, **2843**
Le Guen, F., with others, level regulation on Paris-Toulouse coaxial cable, **2832**
Lehany, F. J., and D. E. Yabsley, solar radiation at 1200, 600 and 200 Mc/s, **(C)861**
Lehmann, G., background noise in amplifiers, **1833**
Lehmann, H., loss-compensated filters in carrier-frequency systems, **1113**
Lehmann, R., with P. Chavasse, definition of complex noise with continuous spectrum, **799**; ultrasonics in everyday life, **2886**
Lehovec, K., measuring capacitance of dry disk rectifiers, **940**; origin of time-lag effect in Se rectifiers, **1686**
—— and H. Kedesdy, graphical determination of Fermi level in inpurity semiconductor, **1343**
Leifer, M., and N. Marchand, periodic systems, cross-correlation and optimum signal/noise ratio for, **(A)2265**, design of, **736**
—— with others, analysis of dot-sequential colour television, **465**; component theory of calculating radio spectra, **2834**
Leitner, A., and R. D. Spence, effect of circular ground-plane on aerial radiation, **567**
Lejay, P., and D. Lepechinsky, effect of temperature on ionized layer formation, **2995**
—— J. M. Ardillon and G. Bertaux, earth's magnetism and propagation of radio waves, **2806**
Lemmens, H. J., M. J. Jansen and R. Loosjes, L-type heavy-duty thermionic cathodes, **773**
Lemmon, K. T., with others, comparison of sound pressures in earphone couplers and in ear, **(A)1811**
Lempicki, A., and A. B. McFarlane, silicone oil vapour and secondary-electron emission, **2740**
Lenaerts, E. H., visual display of binary numbers, **2468**
Lengyel, B. A., reflection and transmission, **1878**, at surface of metal-plate structures, **1879**
Lennartz, H., with H. Boucke, electronic switches, **2935**
Lenz, F., calculation of optical parameters of magnetic electron lenses, **1454**, with bell-shaped field, **705**; rotationally symmetrical potential fields with cylindrical equipotentials, **2256**
—— with W. Glaser, calculation of image formation for magnetic lenses, **3081**
LePage, W. R., and R. F. Gates, feeder problems in broad-band aerial arrays, **(A)2642**
—— C. S. Roys and S. Seely, radiation from circular current sheets, **31**
—— with R. F. Harrington, directional aerial arrays with elements circularly disposed about cylindrical reflector, **(A)2100**
Lepechinsky, D., with P. Lejay, effect of temperature on ionized layer formation, **2995**
Lephakis, A. J., storage devices for communication systems, **1235**
Lepp, H., gases and metals, **1679**
Lepri, F., I. F. Quercia and B. Rispoli, c.r.o. equipment for observation of transients, **165**
Leroy, R., synthesis of 2*n*-terminal passive networks, **64**
Leslie, F. M., radiation from resonant λ/4 transmission lines, **1563**
Lethersich, W., rheological properties of dielectric polymers, **668**
de Leudeville, A., with J. Selz, C.I.T. wave analyser, **3057**
Leven, J. J., h.f. induction heating for motor-car parts, **960**
Leverenz, H. W., with others, structure, properties and uses of ferrites, **368**
Leverton, W. F., and A. J. Dekker, Hall coefficient and resistivity of evaporated Bi films, **1403**
Levina, L. E., with others, electric field in 3-electrode gas-discharge tube, [illegible]
Levine, A. M., and S. Moskowitz, power supplies for television receivers, **(A)2284**
Levine, H., wavelength of spherical resonator, **2320**
—— and C. H. Papas, theory of circular diffraction aerial, **1306**
Levinthal, E. C., with others, magnetic-field measuring instrument, **(A)2226**
Levitas, A., and M. Lax, scattering and absorption by acoustic strip, **2314**
Lewin, G., design of robust valves, **2863**; techniques in magnetic recording for motion-picture production, **2901**
Lewin, L., interference in multichannel circuits, **986**, **(C)1780**, **3100**
Lewin, L., J. J. Muller and R. Basard, phase distortion in feeders, **1067**
Lewis, I. A. D., variations of phase velocity in continuously wound delay lines, **2637**
Lewis, W. W., Protection of Transmission Systems against Lightning, **(B)2112**
Leykhter, L. E., with A. E. Budarov, theory and design of reflex voltmeter, **2767**
Leyland, S. C., with others, field tests of microwave multiplex system, **1243**
Libois, L. J., nonlinear distortion in f.m. transmission, **448**
Lichtman, S. W., h.v. stabilization by means of corona discharge, **2548**
Licklider, J. C. R., intelligibility of quantized speech, **(A)538**
Liebmann, G., mapping of vector-potential distributions in axially symmetrical systems, **1428**
Lifshits, A. M., with N. B. Bogdanova, radio interference on 400-kV lines, **3102**
Lilienthal, J. L., Jr, with others, mechano-electronic transducer for physiological applications, **2791**
Linder, E. G., and K. G. Hernqvist, reduction of space-charge effects in electron beams, **1013**
Lindquist, R., ionospheric effects of solar flares, **1381**; panoramic ionospheric recorder, **1425**
Lindsay, D. G., dual-diversity frequency-shift receiver, **2823**
—— J. P. Blom and J. D. Gilchrist, distance-measuring equipment for civil aircraft, **1392**, **1659**
Lindsay, P. A., properties of e.s. fields in electron lenses, **181**
Lindsey, E. H., with others, effects of contaminants on electrical insulation **139**
Lindström, O., thermistors in ultrasonic interferometry, **3068**
van de Lindt, W. J., with H. G. Beljers, dielectric measurements with magic Tees, **3053**
Linke, J. M., design of reactance filters by use of Zobel X-terminations, **1326**
Lippert, W., with others, bolometer with short time-lag, **3059**
Lippmann, B. A., RC-amplifier bandwidth, **1336**
Lisman, H., phase velocity of e.m. waves over surface of sphere, **(A)2799**
Litchford, G. B., with others, i.c.w. system for distance measurement, **(A)2186**
Little, A. G., with others, radio observations of two large solar disturbances, **2168**
Little, C. G., and A. C. B. Lovell, fluctuations in intensity of radio waves from galactic sources, **1386**
—— and A. Maxwell, fluctuations in intensity of radio waves from galactic sources, **2172**
Little, J. B., travelling-wave valve for amplification at 6-mm λ, **1521**
Little, R. V., Jr, R.C.A. PT-100 theatre television equipment, **2847**
Littlefield, H. Y., with H. F. Meyer, radio communication system using ph.m. transmission and s.s.b. reception, **(A)2270**
Littlewood, J. H., with T. Baldwin, null method for gain and phase shift of l.f. amplifiers, **1728**
Lloyd, E. C., perspective distortion in television pictures, **2024**
Lloyd, W. M., s.s.b. receiver design, **2557**
Locanthi, B. N., high-speed multiplier for analogue computers, **(A)60**
—— with others, nonlinear devices in analogue computers, **143**
Locquin, M., electron microscopes, **1986**
Loeb, J., application of Shannon's communication theory, to telecontrol etc., **2535**, to measurement, **3041**
Loeb, L. B., with C. G. Miller, starting potentials of coronas, **2886**
London, A., with others, long-tube method for field determination of sound-absorption coefficients, **(A)548**
Loosemore, W. R., and J. Sharpe, time delays in l.v. halogen-quenched G-M counters, **2260**
—— and D. Taylor, temperature dependence in G-M counters, **(D)187**
—— with E. Franklin, survey equipment using l.v. halogen-quenched G-M counters, **2258**
Loosjes, R., with others, L-type heavy-duty thermionic cathodes, **773**
Lopukhin, V. M., with S. D. Gvozdover, theory of anode block of plane magnetron, **2598**
Lord, H. W., design of wide-band transformers for linear circuits, **290**
Loughren, A. V., and C. J. Hirsch, comparative analysis of colour-television systems, **1786**
Lovell, A. C. B., radio astronomy, [illegible]
—— with C. G. Little, fluctuations in intensity of radio waves from galactic sources, **1386**
Lovelock, R. T., and J. H. Jupe, Ge diodes, **2059**

Lowrie, R., lattice-type crystal filter, 2377
Luck, D. G. C., properties of wide-band phase-splitting networks, (D)2123
Lucke, W. S., electric dipoles near elliptic or circular cylinders, 1806
Lüdi, F., with W. Frey, theory of travelling-wave valve, 1518
Ludwig, G. D., ultrasonic velocity in and acoustic impedance of animal tissues, 1048
Lumbroso, H., theories of ferroelectricity, 2725
Lun, M. J., with H. E. Farnsworth, secondary emission of Ni-Ba mixtures and Rh bombarded by 50–8000-eV electrons, 1399
Lund, N., measuring adjacent-band radiation from transmitters, 2762
Lundquist, S., magneto-hydrostatic fields, 1892
Lundry, A., delay coincidence circuit for counters, 3086
Lundry, W. R., attenuation and delay equalizers for coaxial lines, 835
Luongo, J., with others, 32-channel high-speed commutator, 295
Lusby, W. S., intensification of X-ray fluorescent images, 2507
Lutz, S. G., calculating transmission-line load impedance, (A)2106; single-tapped coil delay line, (A)2100
Lutzker, L., statistical methods in research and development, 1040
Lux, H., research by Telefunken during the war, 2882
Lyman, H. T., Jr, with D. R. DeTar, variable-inductance television tuner for v.h.f. channels, 1269
Lyman, J., G. B. Litchford and C. Grunsky, i.c.w. system for distance measurement, (A)2186
Lynch, A. C., temperature coefficients of piezoelectric constants of quartz, 921
—— with others, properties and tests of magnetic powders, 1948
Lyons, H., survey of atomic frequency and time standards, (A)1958
—— with others, microwave measurements of dielectric properties of gases, 1426; microwave spectroscopy, with application to chemistry, nuclear physics and frequency standards, (A)1958
Lyubarski, G. Ya., with A. I. Akhiezer, excitation of oscillations in waveguide by means of linear aerial, 2335

M

MacAdam, D. L., quality of colour reproduction, 2553
Macalpine, W. W., heating of r.f. cables, 28
Macdiarmid, I. F., and D. G. Tucker, polyphase modulation for telecommunication filters, 213
MacDonald, D. K. C., spontaneous fluctuations, 79; statistical analysis of electrical noise, (D)293; transit-time phenomena in electron streams, 1088, plasma and beam fluctuations, 2071
—— and K. Sarginson, size effect in conductivity of metals, 328
MacDonald, H. B., with K. E. Latimer, possible applications of ferrites, 1934
MacDonald, J. R., with J. H. E. Griffiths, oscillation-type magnetometer, 1711
Macfadyen, K. A., calculation of distortion in iron-cored a.f. transformers, 1087
Macfarlane, G. G., energy spectrum of nearly periodic pulses, (D)441; theory of contact noise in semiconductors, 910
—— and A. M. Woodward, small-signal theory of wave propagation in uniform electron beam, 261
Machin, K. E., distribution of r.f. radiation across solar disk, 2987
Macht, H. G., 'absolute quadrupole-moment', a fundamental magnetostatic quantity, 110
Mack, C., capacitance of parallel plates with cylinder in torsion between them, (A)2164
MacKay, D. M., calculating machines and human thought, 1698
Mackay, R. W., with others, parameters of simple excess semiconductors, 3014
Mackenzie, R. B., with others, pictorial reproduction in television, 2029
MacNeal, R. H., with G. D. McCann, electric analogue computing techniques for complex vibration problems, (A)189
Macnee, A. B., high-speed product integrator, (A)2220
Macpherson, A. C., and D. M. Kerns, absolute microwave power measurements, (A)1958
Maddock, A. J., with D. J. R. Martin, low-power alternating-voltage stabilizer, 1492
Magat, M., and M. Bruma, resonator for m and dm λ, 2954
Mager, E. L., with others, electroluminescence, new light source, 1341
Magnien, M., with C. Dubin, study of meshed network, 1855
Magnus, W., and F. Oberhettinger, Formulas and Theorems for the Special Functions of Mathematical Physics, (B)146
Magnuski, H., adjacent-channel-rejection receiver, 1480
Magnusson, P. C., rolling-ball analogue of coupled circuits, (A)1114
Mähly, H. J., approximate calculation of e.m. oscillations in cavity resonators, 1594
Maillard, J., J. Voge and P. Chavance, equipment for study of cm-wave propagation, 3115
Maior, A., gravitation and magnetism, 108
Majury, T. G., with others, dielectric-constant method of observing polymerization, 2240
Malan, D. J., and B. F. J. Schonland, electrical processes between strokes of lightning, 2182
Malatesta, S., cathode-degeneration phase inverters, 298, 1865
Mallach, P., dielectric directive radiators, 287
Mallein, R., scanning in cinema television with continuously moving film, 244
Mallinckrodt, A. J., with others, fine structure of lower ionosphere, 1898; measurement of polarization of l.f. ionosphere reflections, (A)2799
Malov, N. N., velocity of H_{0n} waves in multilayer waveguide, 2640
Malsch, F., tuning-indicator valves for receivers, 3160
Malsch, J., electron and electrical conduction in solids, 1342; transistors, 2726
Malter, L., and M. R. Boyd, grid current and emission in thyratrons, 2873
—— and W. M. Webster, determination of gas-discharge constants from probe data, 2972
Malvano, R., metal waveguides with parallelogram cross-section, 2910
Mandel, H., accumulators for very low temperatures, 1493
Mandelbrot, B., adaptation of message to transmission line, 2271, 2827
Mandeville, C. E., with others, construction of radioactivity instruments, 3079
Manley, H., terrestrial magnetic field, 1638
Manley, J. M., magnetic amplifiers, 2116
Mannerberg, E. G., with others, high-stability u.h.f. television tuner, (A)2292
Mansberg, H. P., techniques of c.r.o. photo-recording, 675
Many A., network for eigenvalues and eigenvectors of real symmetrical matrix, 1693
Maple, E., with others, evidence for ionosphere currents from rocket experiments, 2713
March, H. T., M. Yachter and J. Zauderer, inaccuracies in feedback control systems, 223
Marchand, N., colour multiplexing by sine-wave functions, (A)2292
—— H. R. Holloway and M. Leifer, analysis of dot-sequential colour television, 465
—— with M. Leifer, periodic systems, cross-correlation and optimum signal/noise ratio for, (A)2265, design of, 736
—— with others, component theory of calculating radio spectra, 2834
Marchese, T. J., with others, periodic-waveguide travelling-wave amplifier for medium powers, 2047
Marcou, P., frequency compression, 965
Marcuvitz, N., and J. Schwinger, representation of electric and magnetic fields in waveguides, 2638
—— with L. Felsen, half-space as spherical transmission line, (A)2100
Marié, P., propagation of waves of frequency 0·3–10 kMc/s, 435; u.h.f. filters and lenses, 1842
Marin, L. U., and J. J. R. Moral, telecommunication networks using u.h.f. radio links, 2836
Marique, J., frequency-spectrum analyser for radio signals, 167
Markham, J. J., acoustic fields with viscosity and relaxation, (A)1811; mechanisms of sound absorption in fluids, (A)529
Markus, J., with V. Zeluff, Electronics Manual for Radio Engineers, (B)[illegible]750
Marriott, R., and A. L. Cullen, rationalization of electrical theory and units, 322
Marsh, J. A., current distributions on helical aerials, 2647
Marshall, B. O., Jr, analogue multiplier, 1419
Marshall, F. R., with others, Kerr-cell photographic shutter, 235
Marshall, J., transmission-line-reflection voltage-doubling amplifier, 1600
Marshall, J. L., and others, calculation and measurement of loudness, (A)542
—— with others, calculation and measurement of loudness, 2824
Marston, A. E., beam shaping in doubly curved reflector systems, (A)2642
Martin, D. J. R., and A. J. Maddock, low-power alternating-voltage stabilizer, 1492
Martin, R. A., and R. D. Teasdale, tuned coupled circuit for oscillator application, (A)2122
Martin, R. E., radio communications for power systems, 1775
Martin, S. L., and G. F. Weston, spectral emittance of uncoated and oxide-coated Ni cathodes, 1026
Martin, T. L., Jr, Ultrahigh-Frequency Engineering, (B)2077
Martius, U. M., effects of plastic deformation on magnetic properties of polycrystalline metals, 1676
Martyn, D. F., theory of magnetic storms and aurorae, 1374, (D)2993
Margolf, J. M., inductance method for remote indication of tank level, 1463
Mason, J. H., deterioration and breakdown of dielectrics resulting from internal discharges, 1688; random noise in dielectric materials, [illegible]
Mason, S. J., signal flow graphs, (A)2122
Mason, W. P., magnetostriction and morphic effects for Ni crystal, 3020; zero-temperature-coefficient quartz crystals, 2452
—— and R. F. Wick, high-power ultrasonic $BaTiO_3$ transducers, (A)560, 1818
—— with others, coupling coefficients of single-crystal $BaTiO_3$, 2450
Massey, H. S. W., Negative Ions, (B)1883
Masucci, C., with others, Ge diode as video detector, 2589
Mataré, H. F., crystal detectors and use at u.h.f., 775; power adjustment in waveguides, 1565; semiconductors, amplification in, 1037, statistical fluctuations in, 909; sensitivity of diode mixing circuits, 2824; transistor measurement techniques, 1533
Mather, G. R., radiation-pattern calculator for 2-tower arrays, 2350
Mathes, K. N., and others, effects of contaminants on electrical insulation, 130
Matheson, R. M., and L. S. Nergaard, high-speed 10-V effect, 3170
Mathews, W. E., transmission-line equivalent of travelling-wave systems, 2046
Mathias, L. E. S., with A. Cunliffe, perturbation effects in cavity resonators, 70
Matricon, M., and S. Trouvé, distribution of space charge in thermionic valves, 1514
Matsumura, T., with T. Hibi, aggregation of trapping centres in semiconductors, 1926
Matthaes, G., quality of printed resistors, 1584
Matthews, S., with M. V. Callendar, harmonics and intermodulation frequencies in nonlinear amplifiers and mixers, 2956
Matthias, B. T., ferroelectricity, 2451
—— and J. K. Hulm, new ferroelectric tartrates, 2209
—— and J. P. Remeika, dielectric properties of $NaNbO_3$ and $KNbO_3$, 3023
Mattler, J., with G. Destriau, effect of temperature on electrophotoluminescence phenomena, 644
Maurer, P., impedance transformation by h.f. line sections, 833
Mawardi, O. K., sound propagation in narrow conduits, (C)3; transient testing of loudspeakers, (A)2062; wide-range acoustic termination, (A)1811
Maxwell, A., radio emission from sunspot, 14th June 1950, 2700
—— with C. G. Little, fluctuations in intensity of radio waves from galactic sources, 2172
May, E., Industrial High-Frequency Electric Power, (B)716
May, J. C., with others, integration-noise reducer for radar, 360; operation of split-anode magnetron, 1120
Mayer, H., release of electrons on transition from atomic to compact metal, 1397
Mayer, R. W., with H. Chestnut, comparison of steady-state and transient performance of servomechanisms, 222
Mayo, C. G., effect of earth admittances in a.c. bridges, (D)1433
Mayo-Wells, W. J., techniques and applications of f.m./f.m. telemetry, (A)2245
McAdam, W., with others, stabilized wide-band d.c. amplifier, 849
McAlister, K. R., variable-length r.f. transmission-line section, 2907
McCaffrey, B. I., datum correction in radar-altimeter surveying, 1655
McCaig, M., with K. Hoselitz, theory of magnetic properties of anisotropic alloys, 658
McCallum, D. M., and J. B. Smith, design of logical computers, 2467
McCann, G. D., and R. H. MacNeal, electric analogue computing techniques for complex vibration problems, (A)189
—— C. H. Wilts and B. N. Locanthi, nonlinear devices in analogue computers, 143
McCready, L. L., with J. P. Wild, spectrum of high-intensity m-λ solar radiation, 1629
McDonnell, D., effect of circuit losses on noise factor, 3101
McElwee, E. M., statistics of life expectancy of valves, 2045
McFall, R. W., with S. M. Kaplan, noise statistics applied to radar range performance, 1390
McFarlane, A. B., with A. Lempicki, silicone oil vapour and secondary-electron emission, 2740
McGee, J. D., television pickup tubes, 756
—— with E. L. C. White, television camera tubes, (D)2556
McIlwain, K., with H. Pender, Electrical Engineers' Handbook—Electric Communication and Electronics, (B)2808
McIntosh, D. H., geomagnetic effects of solar flares, 2988; sudden commencements at Lerwick, 2175
McIntosh, F. H., and A. F. Inglis, colour television, 1003
McIntyre, A. R., with others, automatic beam blanker for c.r.o., 405
McKay, K. G., determining energy distribution of secondary electrons from insulators, 1347
McKeehan, L. W., with J. S. Kouvelites, magnetostriction of prolate spheroids, 1873
McKinley, D. W. R., deceleration and ionizing efficiency of meteors, 1625
—— with P. M. Millman, meteor velocities, 100
McKinney, C. M., with others, radiation patterns of dielectric rods in TM_{01} mode, 1075
McLachlan, K. B., with R. Yorke, amplifier of variable output impedance, [illegible]
McLachlan, N. W., Ordinary Nonlinear Differential Equations in Engineering and Physical Sciences, (B)1956
McLauchlan, T. A., R. S. Sennett and G. D. Scott, electron-microscope observations on formation of evaporated metal films, 659
McLean, D. A., metallized paper for capacitors, 134
McNaney, J. T., automatic G.C.A., 1658
McNary, B. D., enhanced photoelectric emission from BaO, 1663
McNicol, R. W. E., fading of m.f. and h.f. waves, (D)201
—— and G. de V. Gipps, characteristics of E_1 region at Brisbane, 1899
McPherson, J. C., with K. Millsaps, oscillations of magnetic suspensions, 2153
McRonald, A. D., with others, parameters of simple excess semiconductors, 3014
McSkimin, H. J., with others, coupling coefficients of single crystal $BaTiO_3$, 2450
Meacham, L. A., 4-unit electronic organ, 1787
Mead, J., radiotelegraph network in N.W. Western Australia, 1772
Meagher, J. R., television trouble-shooting and alignment, 1794
Meahl, H. R., and C. C. Allen, calibration of ammeters above 100 Mc/s, (A)1958
Medhurst, R. G., and S. D. Pool, mutual impedance of parallel aerials, (D)1309
Meek, J. M., with J. D. Craggs, recent research on spark discharges, [illegible]
Megaw, E. C. S., scattering of e.m. waves by atmospheric turbulence, 973, (D)1755
Mehrbach, E., with W. H. Sayer, Jr, parallel operation of valves at u.h.f., (A)2292
Mehrotra, R. R., with S. S. Banerjee, multiple reflections and undulations in F_2 region, 2526; radiation resistance of skew-wire r.f. transmission lines, 817
Meinel, A. B., entry of protons into atmosphere during aurora, 636
Meinke, H. H., e.m. waves in nonuniform lines, 2334; h.f. properties of curved uniform lines, 2633
Meinken, R. H., with others, high-temperature vacuum induction furnace, 3078
Meister, E., objective measurements on telephone earpieces, 2895; thermal-noise generator for 30 c/s–15 kc/s, 24
Meixner, J., diffraction of e.m. waves by disk, 94
Meltzer, B., identity of thermal and shot noise, 292
Melville, H. W., with others, dielectric-constant method of observing polymerization, 2240
Melville, W. S., saturable reactors in pulse generators, 2362
Mendelev, B. G., with others, electric field in 3-electrode gas-discharge tube, 2874
Mendousse, J. S., P. D. Goodman and W. G. Cady, capacitance bridge for h.f., 1717
Mentzer, J. R., measurement of radar echoing areas of conducting bodies, (A)2186
Menzel, W., with O. Augustin, solar and terrestrial phenomena during sudden ionospheric disturbance 19th Nov. 1949, 885
Menzer, E., and H. Voelkel, l.f. technique in u.s.w. broadcasting, 453
Mercier, J., radiation pressure in acoustics, 2888; Si crystal detectors, 2070
Merlet, M., simultaneous feeding of one aerial from two transmitters at Toulouse-Muret, 1506
Merrill, F. G., with others, d.c. amplifiers using magnettors, (A)2122
Merrill, J. L., Jr, Type E1 negative-impedance repeater, 1323, 1770
Merriman, J. H. H., and R. W. White, application of f.m. to v.h.f. multichannel R/T, (D)1241
Merritt, F. R., with others, ferromagnetic resonance in ferrites, 1674
Mertz, P., A. D. Fowler and H. N. Christopher, quality rating of television images, 751
Merz, W. J., dielectric properties of $BaTiO_3$ at low temperatures, 1945
—— with M. E. Caspari, electromechanical effects in $BaTiO_3$ single-domain crystals, 918
Mesnard, G., thoria, semiconductor properties of, 2730, thermionic properties and activation of, 504, 774
Mesnard, G., and R. Uzan, treatment of tungsten wire for valves, 1412
Metcalf, D. F., with others, tropospheric scattering of radio waves, 2811
Métivier, R., with others, test methods and apparatus for 3-cm l.v. klystrons, 683; wide-band a.t.r. and t.r. gas-discharge switches, 2044; 3-cm l.v. reflex klystron RHK 6332, 2069
Metson, G. H., residual-vacuum characteristic of thermionic valve, 1660
Metzger, L., with H. George, Samica mica paper, 1407
Meyer, A. J. P., gyromagnetic constant of ferromagnetic elements and alloys, 1932
—— and P. Taglang, ferromagnetism, of alloy $FeBe_2$, 2203, of Co/Zn alloys, 2735; magnetic properties of Cu in solid solution in Co and in Fe/Ni alloy, 655
Meyer, H. F., and H. Y. Littlefield, communication system using ph.m. transmission and s.s.b. reception, (A)2270
Meyer de Stadelhofen, J., locator of r.f. interference sources on overhead power lines, 1483
Meyer-Eppler, W., analysis of oscillations by search-tone method, 532
Meyerhoff, A. A., interaction between surface-wave transmission lines, (A)2100
Meyer-Schützmeister, L., external photoelectric effect in Cu_2O and CuO, 2555
Michaels, E. L., loci of complex impedance and admittance functions, (A)2125
Michaelson, H. B., variations of grid contact potential and associated grid currents, 264
Michel, B., with Thien-Chi N'Guyen, special Ni/Fe alloys prepared by powder metallurgy, 2460
Michels, A., and C. A. ten Seldam, influence of inductances on determination of capacitances, 1961
Michels, A. J., with J. M. L. Janssen, 'stroboscopic' oscilloscope for frequencies up to about 50 Mc/s, 1435
Middleton, H. A., Receiving Tube Substitution Guide Book, (B)2072
Miedzinski, J., and S. F. Pearce, performance of screening rooms, 458
Mikhenewitch, N., and M. Alixant, Williamson very-high-fidelity amplifier, 1334
Mildner, R. C., cables, h.f., in television, 278, r.f., power rating of, 26, for sound-distribution systems, 2905
Miles, J. G., saturable reactors in high-speed digital computers, (A)2220
Millar, N. P., expanded-scale voltmeter for a.c., 160
Miller, C. G., and L. B. Loeb, starting potentials of coronas, 2686
Miller, D. A., and E. A. Slusser, television receiver noise calculations, 3142
Miller, F. G., stylus/groove relations in reproduction, (A)550
Miller, F. P., with G. B. Fanning, tropospheric radio propagation, (A)2799
Miller, H. G., with E. M. Ostlund, 1·7–2·4-kMc/s triode amplifier, (A)2122
—— with L. Staschover, television-link sound diplexer, 3126
Miller, M. L., design of equipment using subminiature components, 839
Miller, P. M., f.m. receiver for 88–108-Mc/s band, 781
Miller, S. E., and A. C. Beck, low-loss waveguide transmission, (A)2100
—— and W. W. Mumford, multi-element directional couplers, (A)2100
Miller, W., effective radius of earth for radio propagation beyond horizon, 1475
Millership, R., and F. V. Webster, h.f. permeability of ferromagnetic materials, 913
Millington, G., effect of earth's magnetic field on s.w. communication, (A)2305
Millman, P. M., and D. W. R. McKinley, meteor velocities, 100
Mills, B. Y., 1-MV resonant-cavity X-ray tube, 706
—— with others, solar radiation at 50 cm during eclipse, 346
Millsaps, K., and J. C. McPherson, oscillations of magnetic suspensions, 2153
Milne, E. A., gravitation and magnetism, 1637
Milnes, A. G., magnetic amplifiers, (D)1094, (D)1582, new theory of, 48, (A)582
Milnes, B., and R. S. Unwin, radio meteorological investigation in New Zealand, 260
Mims, H., with W. Rudmose, equipment for field measurement of reverberation times, (A)1811
Minc, A., with W. C. Peterman, 4/2-channel time-division-multiplex telegraph system, 3108
Mindlin, R. D., thickness-shear and flexural vibrations of crystal plates, 1581
Miner, R. C., with E. E. Mott, ring-armature telephone earpiece, 1296
Ministry of Civil Aviation, Consol — Radio Aid to Navigation, (B)901
Minnett, H. C., and N. R. Labrum, solar radiation at 3·18 cm, 343
—— with J. H. Piddington, solar radiation at 1·25 cm, 342
Minnis, C. M., ionospheric storms and radio-circuit disturbances, 1470
—— with A. F. Wilkins, comparison of ionospheric transmission forecasts with practical results, 2520
Minorsky, N., differential equation occurring in physics, 1693; Mathieu's nonlinear oscillator, 2951; parametric excitation of oscillations, 1338
Mirimanov, R. G., complex radiation resistance of coupled aerial systems, 1346
Mitra, A. P., with S. S. Baral, ionosphere over Calcutta, Jan. 1945–June 1950, 831
Mitra, S. N., anomalous behaviour of multiply reflected ionosphere echoes, 2527; s.w. fading due to interference between magneto-ionic components, 2815
Moats, R. R., mode interaction in magnetron oscillators, (A)2304
Moen, C. J., ultrasonic absorption in liquids, (A)531, 1550
Moir, J., automatic programme monitor, 2280; British recorders and reproducers, 1559; loudspeaker diaphragm control, 2626; new theories of studio acoustics, 803
Mol, E. A. J., polyvinyl chloride insulation for wires, 1944
Molinari, H., signal-generator output systems, 411
Moline, J., delay lines, 2914; self-blocking oscillator and applications, 1116; sinusoid-pulse and pulse-sinusoid transformations, 2927; transcontinental series of television valves, 3162
Möller, H. G., c.r.o. for dm waves, 406
Molloy, C. T., response peaks in finite horns, 6
Monnot, R., film television transmission by nonstorage systems, 463
Monro, C. R., flying-spot camera Type TK-3A, 1265
Monroe, R. B., with G. E. Sterling, The Radio Manual, (B)794
Monteath, G. D., application of compensation theorem to radiation problems, (A)2848; wide-band folded-slot aerials, 570
Montgomery, G. F., cascaded binary counter with feedback, 2860; incremental-delay pulse generator, 1725
Montgomery, H. C., background noise in transistors, 779
—— with W. A. Munson, speech analyser and synthesizer, (A)539
Montroll, E. W., with R. W. Hart, scattering of plane waves by 'soft' spherical obstacles, 2139
Moody, N. F., d.c. amplifier for portable ionization-chamber instruments, 2797
Moon, J. H., development of aircraft automatic radio compass, 2190
Moore, A. D., development of fluid mappers, 3040
Moore, A. F., with others, experimental determination of geomagnetic radial variation, 351
Moore, A. R., and F. Herman, electron-bombardment-induced conductivity

in Ge rectifiers, **1685**

Moore, C. E., developments in radar for merchant-marine service, **1391**

Moore, H. S., and M. Stein, comparison of ionospheric solar indices, **884**

—— with M. L. Phillips, dispersion of F_2-layer critical frequencies, **(A)2799**

Moore, R., J. Fisher and J. Chatten, flying-spot colour-signal generator, **(A)2292**

Moore, R. K., aerials in conducting media, **(A)2642**; aurora, and magnetic storms, **2994**, and v.h.f. propagation phenomenon, **2002**, **(A)2799**

—— with C. W. Gartlein, southern extent of aurora borealis in N. America, **1903**, **(A)2712**

Moral, J. J. R., with L. U. Marin, telecommunication networks using u.h.f. radio links, **2836**

Morand, —, radio communications equipment for armed forces, **2540**

Moret, R., with L. Fontes, auxiliary circuits for G-M counters, **1105**

Morgan, C. G., with others, influence of electrodes in starting gas discharge, **1615**

Morgan, J. M., with others, portable television pickup equipment, **(A)2292**

Morgan, M., television transmission and reception on 480 Mc/s, **494**

Morgan, M. G., and W. R. Evans, Jr, synthesis and analysis of elliptic polarization loci, **2416**

Moriarty, O. M., propagation measurements for Tasmania/mainland R/T link, **1759**

Morisse, B., T.R. 153 receiver, **2818**

Morita, T., theory of concentric slot aerial, **(A)2100**

Moroz, L. M., with others, formation of conducting bridges in suspensions, **2688**

Morrical, K. C., R. W. Benson and H. Davis, performance of audiometers, **1053**

—— with others, American Standard Z24.9-1949, coupler calibration of earphones, **21**

Morrill, C. D., with R. V. Baum, time division multiplier for electronic differential analyser, **(A)2220**

Morris, A. L., small power transformers for aircraft, **(D)581**

Morris, L. P., equipment for 450 Mc/s, **2278**

Morris, R., with T. W. Bennington, reception of London 41·5-Mc/s signals in South Africa, **722**

Morrish, A. H., and A. J. Dekker, decay of luminescence of KBr and LiF, **904**

Morrison, L. W., television transmission in local telephone exchange areas, **2841**

Morrison, L. W., Jr, television terminal equipment for coaxial systems, **1005**

Morse, R. W., dependence of 'shadow-zone' sound on surface sound-velocity gradient in ocean, **1044**

Mortley, W. S., frequency generation and measurement, **(D)1188**

Morton, C. W., extension of Lommel integrals to Struve functions, with acoustic application, **138**

Morton, J. A., and R. M. Ryder, design factors of Type-1553 triode, **510**

Moses, R. C., Ge-diode impulse-noise limiters,. **445**; improved frame-synchronization system, **1494**; video amplifier design, **319**

Mosher, W. A., with others, bibliography of sonic and ultrasonic applications in biology, biochemistry and biophysics, **1813**

Moskowitz, S., L. Diven and L. Feit, crosstalk in time-division multiplex systems, **740**

—— with A. M. Levine, power supplies for television receivers, **(A)2284**

Moss, H., cathode-resistance stabilization of c.r.-tube gun current, **2596**

Moss, T. S., photoconductivity, of Mg_3Sb_2 layers, **1168**, of various elements, **3149**; refractive index and infrared sensitivity threshold of photoconductors, **1273**

Mostafa, A. E. S., valve performance for large signal voltages, **1517**

Mott, E. E., and R. C. Miner, ring-armature telephone earpiece, **1296**

Motz, H., Electromagnetic Problems of Microwave Theory, **(B)2113**; radiation from fast electron beams, **2411**

Moullin, E. B., non-ohmic resistor in series with impedance, **2657**; The Principles of Electromagnetism, **(B)623**

Mourier, G., 'anticylotron' travelling-wave valve with magnetic field, **260**

—— with others, travelling-wave valves with magnetic field, **1020**

Moyer, R. C., D. R. Andrews and H. E. Roys, methods of calibrating frequency records, **533**

Moyzhes, B. Ya., excitation of e.m. oscillations, **2415**

Mühleisen, R., lightning discharges upwards from thunderclouds, **2183**

Müller, H., measurement of distortion in broadcasting transmitters, **2566**

Muller, J. J., with others, phase distortion in feeders, **1067**

Müller, K., first German post-war high-power transmitters, **2565**

Müller, R., solar and terrestrial phenomena during sudden ionospheric disturbance 19th Nov. 1949, **885**; stability and attenuation of e.m. waves in waveguides, **813**

Mumford, W. W., with A. E. Bowen, Type-1553 triode as modulator and amplifier, **310**

—— with S. E. Miller, multi-element directional couplers, **(A)2100**

Munro, G. H., work of Australian Radio Research Board, **1999**

Munson, W. A., and H. C. Montgomery, speech analyser and synthesizer, **(A)539**

Munster, A. C., monoformer c.r. tube, **1033**

Murdock, C. E., high-power tetrode, **(A)2304**

Murray, P. C., with others, spurious counts in G-M counters, **1990**

Müser, H., Fermi limiting energy of electronic semiconductors, **1876**; operating limits of photoresistances, **2861**

Musson-Genon, R., J. Chantereau and R. Métivier, test methods and apparatus for 3-cm l.v. klystrons, **683**

—— R. Métivier and R. Paliès, wide-band a.t.r. and t.r. gas-discharge switches, **2044**

—— with others, 3-cm low-voltage reflex klystron RHK 6332, **2069**

Myers, G. F., distributed amplification for pulses, **(A)2122**

Myers, R. H., design of loran transmitter, **2300**

N

Nagata, T., southward shift of auroral zone during magnetic storms, **(D)2710**

Naimark, G. M., J. Klair and W. A. Mosher, bibliography of sonic and ultrasonic applications in biology, biochemistry and biophysics, **1813**

Naismith, R., and R. Bailey, automatic ionosphere recorder for 0·55–17 Mc/s, **1191**

Nakamura, T., with others, travelling-wave c.r. tube, **503**

Nash, H. C., with E. F. Carome, selective relay amplifier for recording WWV time signals, **74**

National Bureau of Standards, Computation Laboratory, Table of the Bessel Functions $Y_0(z)$ and $Y_1(\cdot)$ for Complex Arguments, **(B)935**

Neal, R., with others, design of 10^9-eV linear electron accelerator, **(A)2245**

Nearhoof, H. J., with A. H. Benner, polarimeter for study of l.f. ionospheric echoes, **415**

—— with J. M. Kelso, polarization of long waves reflected from ionosphere, **(A)2799**

Nebel, C. N., local wire television networks, **2291**

Needle, J. S., and others, single-cavity resonator for multi-anode magnetron, **(A)2304**

Nelson, A. H., p.t.m. telemetry, **(A)2245**

Nelson, H., base-metal effects with thoria-coated filaments, **1028**

Nelson, J. H., s.w. propagation correlated with planetary positions, **1997**

Nelson, P. A., with others, heating of bone and bone marrow by ultrasonic radiation, **(A)527**

Nelson, R. H., surface-wave transmission line, **(D)2333**

Nentwig, K., secondary-electron multipliers and their technical significance, **2041**

Neppiras, E. A., with B. E. Noltingk, ultrasonic soldering of Al, **174**; ultrasonic soldering irons, **1732**

Nergaard, L. S., with R. M. Matheson, high-speed 10-V effect, 3170

Nertney, R. J., with J. J. Gibbons, wave solutions of ionosphere-reflected long waves, **(A)2799**

Nesbitt, E. A., magnetostriction of permanent-magnet alloys, **127**

—— with others, nucleation and magnetic properties of alnico V, **657**

Nestel, W., experimental television transmissions in N.W. Germany, **3129**

Neuber, R. E., with J. W. Clark, end-cooling of power-valve filaments, **1024**

Neuert, H., contact-potential measurements on irradiated metal-oxide surfaces, **80**; counters, ultraviolet-sensitive, after-effects in, **188**, vapour-filled, discharge mechanism for oversize pulses in, **2510**; production of ion beams by h.f. discharge, **88**

—— with E. Fünfer, oversize pulses in vapour-filled counter tubes, **1460**

—— with B. Koch, random electron oscillations in h.f. gas discharge in magnetic field, **614**

Nevin, S., and H. Salinger, secondary-emission surfaces exposed to oxide-coated cathodes, **2056**

Newell, H. E., Jr, upper-atmosphere research from rockets, **2180**

Newton, C. C., F. J. Hyde and H. G. Foster, measurement of gyrointeraction, **155**

Newton, G. C., Jr, statistical filter theory for feedback control systems, **(A)2122**

Newton, H. W., solar activity, Jan.–June 1950, **106**

—— and H. F. Finch, solar activity and geomagnetic storms, 1950, **1631**

Neyret, G., with others, effect of radioactivity on thermoelectronic emission, **2301**; radioactive elements in study of oxide cathodes, **1522**

Neyron, A., with M. Kobrynski, measurement of sound transmission through partitions, **2616**

N'Guyen, Thien-Chi, electrical contacts and powder metallurgy, **923**

—— and B. Michel, special Ni/Fe alloys prepared by powder metallurgy, **2460**

—— and J. Suchet, thermistors, **44**

Nichols, M. H., and L. L. Rauch, radio telemetry, **1978**

Nicolet, M., atmospheric scale-height gradient and variation of ionization and s.w. absorption, **1644**

Nienburg, R. E., and T. F. Rogers, storage tube as amplitude distribution analyser, **(A)2226**

Niessen, K. F., earth's constants from measurements near transmitter, **109**

Nieuwdorp, H., with others, Philips 100-kV electron microscope, **1458**

Niguet, P., asymmetry in wave propagation on Paris/Algiers link, **1467**

Nijenhuis, W., impedance synthesis with loss distribution in reactance elements, **1109**

Nilsson, B., with S. Ekelöf, high-sensitivity automatic recording potentiometer, **1989**

Nitsche, H., h.f. connectors, **2906**

—— with others, high-power f.m. broadcasting transmitters, **764**

Nixon, J. D., and A. O. Williams, Jr, surface vibration patterns of piezo-electric radiators, **(A)558**

Nixon, R. D., with others, pictorial reproduction in television, **2029**

Noble, S. W., with F. C. Williams, application of magnetic modulators in amplification of small d.c. signals, **152**, **(A)682**

Noll, E. M., video circuits in modern television sets, **2561**

Nolle, A. W., viscosity effects in acoustic inductances, **(A)1811**

Nolte, H. J., and R. F. Spurck, metal/ceramic sealing using Mn/Mo mixture, **1410**

Noltingk, B. E., high-power ultrasonic generators, **1544**

—— and E. A. Neppiras, ultrasonic soldering of Al, **174**; ultrasonic soldering irons, **1732**

Norinder, H., atmospherics produced by electric discharges in snow squalls, **1910**

Norton, K. A., and E. W. Allen, variation with frequency of range of f.m. and television transmitters, **2281**

Norton, L. E., performance of oscillators controlled by gas absorption lines, **(A)1958**

Noskowicz, T. S., with C. S. Szegho, electron-gun ion trap, **3183**

Nottebrock, H., Bauelemente der Nachrichtentechnik, Teil I, Kondensatoren, **(B)851**

Nowak, A., demodulation in u.s.w. f.m. receivers, **2820**

Noyer, R. O., with others, test-pattern generator for colour-television signals, **(A)2292**

Nuckolls, R. G., with others, microwave spectroscopy, with application to chemistry, nuclear physics and frequency standards, **(A)1958**

Nuttall, T. C., phase and gamma correction in television, **473**

Nylund, H. W., with W. C. Babcock, aerial systems for multichannel mobile R/T, **569**

O

Oakes, F., measurement of resistor noise, **945**

Oberhettinger, F., with W. Magnus, Formulas and Theorems for the Special Functions of Mathematical Physics, **(B)146**

Oboril, F., with others, ionospheric observation at Dakar, **1148**

Oda, M., and T. Takamura, solar noise at 3·3 kMc/s, **2984**

Ohman, J., and P. M. Erlandson, vibroton transducer, **(A)2245**

Oldenburger, R., Mathematical Engineering Analysis, **(B)3038**

Oliner, A. A., and H. Kurss, measurement of equivalent circuit parameters of dissipative microwave structures, **(A)2100**

Oliver, B. M., 'rooter' for *n*th root of video signals, **754**; tone rendering in television, **757**

Oliver, M. H., with others, h.f. resistance standards for calibration of admittance bridge up to 60 Mc/s, **691**

Olson, C. V., with J. V. L. Hogan, high-speed f.m. facsimile, **461**

Olson, H. F., loudspeakers, cabinets for high-quality, **2897**, direct radiator, mounting for, **(A)2082**, sensitivity, directivity and linearity of, **275**

—— and D. F. Pennie, automatic nonlinear distortion analyser, **(A)1811**, **1836**

Olson, N., mathematical analysis of acoustic filter, **12**

O'Meara, F. E., circuits and valves for ultrasensitive electrometers, **1967**

Oono, Y., synthesis of finite 2*n*-terminal network, **65**

van Oosterhout, G. W., with others, controlled-valency semiconductors, **905**

Op den Orth, J. M., oscillations in circuits with iron-cored coils, **66**

Orchard, H. J., networks, RC, synthesis of, **2371**, 2-phase, wide-band, **1103**

Ordung, P. F., and H. L. Krauss, cathode-coupled clipper response, **(A)2122**; frequency-coordinate vector diagram, **1578**

—— with J. T. Fleck, transfer-ratio synthesis by RC networks, **(A)2122**

Ortman, G., with N. Ril', ZnS-Cu phosphors, **124**

Ortusi, J., and G. Boissinot, slotted waveguides and use as aerials, **815**

—— and P. Fechner, modulation on waveguides, **1012**

—— and J. C. Simon, diffraction by paraboloids of revolution, **820**

Ory, A., evolution of television, **248**

Osherovich, A. L., with S. F. Rodionov, secondary-electron photon counter, **2509**

Ostlund, E. M., and H. G. Miller, 1·7–2·4-kMc/s triode amplifier, **(A)2122**

Oswald, J., limited-spectrum signals, and modulation theory, **2829**, random, **3106**, and their transformations, **210**

Ott, H., Zenneck wave in field of radiator, **2516**

Otte, J., with B. G. Dammers, interelectrode feedback in frequency changers, **1482**

van Overbeek, A. J. W. M., voltage-controlled secondary-emission multipliers, **2583**

Overton, B. R., permanent-magnet lenses for television tubes, **(D)484**

Owaki, K., and others, travelling-wave c.r. tube, **503**

Owen, R. B., and E. A. Sayle, scintillation counting equipments, **2258**

Oyston, H. J., with others, television synchronizing-signal generator, **749**

P

Pachner, J., piston source, in infinite wall, velocity potential of, **1816**, **(C)2610**, radiation field of, **1817**

Paetzold, H. K., with others, vertical distribution of ozone, **1376**

Page, H., indoor television slot aerial, **2559**

Painter, H. E., international radiosonde trials, Payerne, **697**

Paldus, G., compensation and measurement of small direct voltages, **2760**

Paliès, R., with others, wide-band a.t.r. and t.r. gas-discharge switches, **2044**

Palm, A., Registrierinstrumente, **(B)3064**

Pan, W. Y., design of u.h.f. converters, **442**

Pannenborg, A. E., microwave measurement equipment, **946**, **1966**

Panter, P. F., and W. Dite, quantization distortion in pulse-count modulation, **1483**

Papas, C. H., and R. King, radiation from wide-angle conical aerials, **1307**

—— with H. Levine, theory of circular diffraction aerial, **1306**

Papian, W. N., ferromagnetic cores for digital storage devices, **(A)2220**

Pappenfus, E. W., stabilized master oscillator for multichannel communication, **1117**

Parkash, O., temperature variations in alcohol/argon-filled G-M counters, **423**

Parker, R., magnetoresistance, saturation, of ferromagnetic alloys, **3018**, of silicon-iron, **1164**

Parkin, P. H., and W. E. Scholes, speech-reinforcement systems, **1294**

Parkinson, W. C., with others, sudden commencements and impulses in geomagnetism, **2708**

Parodi, M., Équations Intégrales et Transformation de Laplace, **(B)2756** formation of positive definite matrices, **2941**; stability, criterion of, **1312**, study of, **579**

Parrish, W., manufacture of quartz oscillator plates, **663**, **664**, **1940**

Parry, C. A., cathamplifier, **78**

Parry, J. V. L., dielectric measurements at 300–600 Mc/s, **2763**

Partridge, N. G., colour-coded wiring system, **2378**

Parzen, B., wide-range frequency meter and signal generator, **(A)2226**

Parzen, P., and L. Goldstein, current fluctuations in d.c. gas discharge plasma, **2974**; hydrostatic pressure in electron beam in travelling-wave valves, **2580**

—— with others, travelling-wave-valve amplifier, **(A)2270**, for medium powers, **2047**

Paschkis, V., comparison of long-time and short-time analogue computers, **142**

Pask, J. A., glass/metal seals, **1173**

Päsler, M., and W. Reichardt, Fourier spectrum of forced oscillations due to step and needle impulses, **68**

Pastori, M., wave propagation in anisotropic medium, **2400**

Patchett, G. N., precision alternating-voltage stabilizer, **227**, **1253**

Patrushev, V. L., curvilinear coordinates for calculation of Π-type cavity resonator, **2385**

—— and O. V. Romanova, design of Π-type cavity resonator, **2386**

Pattison, D. R., and others, field tests of microwave multiplex system, **1243**

Pawley, M. G., phase control with constant attenuation, **299**

Pawsey, J. L., solar r.f. radiation, **104**

Payne, E. C., E. L. Mager and C. W. Jerome, electroluminescence, new light source, **1341**

Payne, H. E., with others, design and operation of 30-MeV synchrotron, **1213**

Payne-Scott, R., with others, radio observations of two large solar disturbances, **2168**

Peachey, F. A., G. Stannard and C. Gunn-Russell, portable repeater for broadcast programmes, **2831**

—— with others, automatic monitors for broadcasting programmes, **1491**

Pearce, S. F., and D. C. G. Smith, narrow-pulse generator, **(D)2776**

—— with J. Miedzinski, performance of screening rooms, **458**

Pearson, G. L., with W. H. Brattain, conductivity changes induced in Ge by α-particle bombardment, **1162**

—— with others, theory and experiment for Ge *p-n* junction, **1669**

Pearson, P., with others, design of 10^9-eV linear electron accelerator, **(A)2245**

Pearson, R. M., with F. A. Benson, pulse generator with fixed repetition rate, **843**

Peck, R. C., with V. C. Pineo, circuit for recording radar-type reflections, **1915**

Pecker, C., with M. Laffineur, r.f. emission due to gyromagnetic effect in discharge, **1139**

Pélissier, R., propagation of transient and periodic waves along transmission lines, **1070**

Pell, J., cosine deflection yoke, **3136**

Peltier, J., with G. Soulé-Nan, method of calculating certain integrals, **2917**

Pender, H., and K. McIlwain, Electrical Engineers' Handbook—Electric Communication and Electronics, **(B)2607**

Pennie, D. F., with H. F. Olson, automatic nonlinear distortion analyser, **(A)1811**, **1836**

Penrose, H. E., and R. S. H. Boulding, Principles and Practice of Radar, **(B)3011**

Pernik, J., modern batteries in telecommunications, **3120**

de la Perrelle, E. T., with others, influence of electrodes in starting gas discharge, **1615**

Perron, R. R., high-power attenuating tuner for 10-cm cavity, **1859**

Perrot, M., with A. Blanc-Lapierre, conductivity of thin Ag films in strong electric fields, **651**; diffraction and quantity of information, **209**

Perry, K. E., with others, measurement of resolving time of counters, **715**

Peter, R. W., direct-reading noise-factor-measuring systems, **3043**

Peterman, W. C., and A. Minc, 4/2-channel time-division-multiplex telegraph system, **3108**

Peters, R. G., component miniaturization techniques, **2947**; mechanized production and unitized construction, **2948**; printed-circuit production and assembly techniques, **1329**, **1592**; television receiving aerials, **1845**

Petersen, H., measurement of very high resistance at high alternating voltage, **2229**

Peterson, A., nonlinear distortion in hearing aids, **(A)1811**

—— and D. B. Sinclair, single-ended push-pull audio amplifier, **(A)2082**

Peterson, A. M., mechanism of F-layer-propagated back-scatter echoes, **2808**

Peterson, A. P. G., with others, apparatus for acoustic impedance measurement, **(A)534**; calculation and measurement of loudness, **(A)542**, **2324**

Peuteman, A., binary counter with additive or subtractive operation, **1697**

Peysson, J., high-power capacitors with ceramic dielectric, **832**

Pfann, W. G., effect of composition of contact point in Ge rectifiers, **1942**; transistor as reversible amplifier, **509**

Pfann, W. G. and J. H. Scaff, *p*-type Ge transistor, **508**

Pfefferl, A., with others, high-power f.m. broadcasting transmitters, **764**

Pfister, A. C., with others, carbon and borocarbon pyrolytic film resistors, **2365**

Pfister, W., magneto-ionic multiple splitting determined by phase-integration method, **(A)2712**

Pfost, W., input admittance, etc., in variable 3-stage filters, **2669**

Pfotzer, G., conductivity contour of barrier layer in Cu_2O rectifier, **997**

—— with others, vertical distribution of ozone, **1376**

Philipp, E. M., measurement of damping variations for cm waves, **841**; wavelength and damping of cavity resonators containing dielectric rings, **1862**

Phillips, C. S. E., dielectric properties of solid HCl and DCl, **2742**

Phillips, G. J., wide-band aerial system for circularly polarized waves, **2353**

—— with B. H. Briggs, horizontal irregularities of ionosphere, **980**

Phillips, M. L., and H. S. Moore, dispersion of F_2-layer critical frequencies, **(A)2799**

Phillips, R. S., e.m. field produced by helix, **1349**

Phillips, T., WKPT and WKPT-FM, Kingsport, Tennessee, **1247**

Picard, R. G., and J. E. Joy, metal evaporator using h.f. heating, **2497**

Pickard, G. W., and H. T. Stetson, comparison of tropospheric reception at 44·1 and 92·1 Mc/s over 167-mile path, **977**, **(A)1227**

Pickles, S., effect of vertical radiation pattern on omnirange beacon characteristics, **(A)2186**

Piddington, J. H., derivation of model solar chromosphere from radio data, **345**

—— and J. V. Hindman, solar radiation at 10 cm during eclipse, **347**

—— and H. C. Minnett, solar radiation at 1·25 cm, **348**

Pieplow, H., selective generation, amplification or rejection of alternating voltages, **1166**

Pierce, J. R., mm-wave sources, **1596**; stability of electron flow in presence of positive ions, **611**; Traveling-Wave Tubes, **(B)511**; travelling-wave valves, **501**

Piéron, H., cerebral mechanisms of binaural functions, **(D)2889**

Pietenpol, W. J., Ge *p-n* junction rectifier and photocell, **2302**

—— with R. L. Wallace, Jr, circuit properties of *n-p-n* transistors, **2957**

Pietermaat, F. P., and A. de Keuster, dielectric properties of diamond, **2210**

Piety, R. G., linear operational calculus of empirical functions, **(A)2122**

Pihl, G. E., with others, statistical properties of speech sounds, **(A)540**, **1827**

Pike, W. S., with others, portable television pickup equipment, **(A)2292**; storage oscilloscope, **3055**

Piloty, R., assessment of modulation systems on basis of channel capacity, **2017**

Pimonow, L., high-power ultrasonic siren, **1822**

Pinciroli, A., 2-pole compensation networks, **61**

Pineo, V. C., and R. C. Peck, circuit for recording radar-type reflections, **1915**

Pines, D., with D. Bohm, 'collective' description of electron interactions, **2975**

Pinkerton, J. M. M., a.f.c. of clock pulse frequency in digital computers, **2364**

Pipe, D. W., sound-reinforcement system, Church House, Westminster, **1838**

Pippard, A. B., penetration of magnetic field into superconducting tin, **330**; resistance of single crystals of tin at 9·4 kMc/s, **329**

Pircher, G., u.h.f. discriminator, **2758**

Pistoulet, B., with others, properties of magnetic powders at u.h.f., **878**

Pit, H. F., with E. J. Post, alternative methods of feedback-oscillator

analysis, 1860
Piach, D. J., and P. B. Williams, 3-unit high-fidelity loudspeaker, 276
Plessner, K. W., with E. Billig, dielectric dispersion in polycrystalline materials, 2198
Pluvinage, P., and G. Taylor, measurements of atmospheric electric field in Greenland, 1153
Pohl, R. W., fundamental and derived magnitudes, 2976
Pohl, W. J., design and manufacture of planar grids for u.h.f. triodes, 2594
van der Pol, B., radiation of beam aerials and large surfaces, 40
—— and H. Bremmer, Operational Calculus, based on the Two-sided Laplace Integral, (B)1700
Poliakoff, A., hearing-aid design, 23
Pollack, I., threshold and loudness of repeated bursts of noise, (A)543
Pollock, A. M., thorn needles for gramophones, 806, (D)2069
Pomerantz, M. A., cosmic-ray intensity increase after solar flare, 1890; cosmic-ray radiosonde and telemetering system, 2495
Pool, S. D., with R. G. Medhurst, mutual impedance of parallel aerials, (D)1309
Poole, F. L., with others, Kerr-cell photographic shutter, 235
Poritsky, H., extension of Weyl's integral for harmonic spherical waves, 3034
de Possel, R., and C. Pouget-Michel, Huyghen's principle for e.m. wave, 2695
Post, E. J., and H. F. Pit, alternative methods of feedback-oscillator analysis, 1860
Post, R. F., and L. I. Schiff, statistical limitations on resolving time of scintillation counters, 967
Potter, R. F., with G. R. White, prediction of ionospheric data for antipodal stations, 880
Pouget-Michel, G., with R. de Possel, Huyghens' principle for e.m. wave, 2695
Powles, J. G., interpretation of dielectric measurements using Cole-Cole plot, 1406
Prache, P. M., and R. Cazenave, cylindrical-coil theory and calculation of reluctance, 2658; measurement of permeability and magnetic losses of straight samples, 156
du Pré, F. K., with others, Fermi levels in semiconductors, 906
Preisman, A., loudspeaker damping, 2328
Pressler, H., statutes on h.f. in Germany, 3103
Pressman, A. I., and J. P. Blewett, 0·3–4 Mc/s electrically tuned oscillator, 1332
Price, A. T., e.m. induction in semi-infinite conductor, 1617
—— and G. A. Wilkins, daily magnetic variations in equatorial regions, 2707
Prime, H. A., and R. C. Turnock, iconoscope electro-optical shutter for high-speed photography, 1223
—— with others, scattering of 3-cm radiation by ionized gases, 96
Prince, M. D., with M. A. Honnell, v.m. in television-image reproduction, 2296
Pritchard, R. L., directivity and efficiency of linear arrays of transducers, (A)513
Pritchard, W. L., with W. M. Hall, optimum operation of echo boxes, 2720
Proctor, R. F., input impedance of horizontal dipole aerials at small heights, (D)35
Prowse, W. A., breakdown in gases subjected to h.f. fields, 613
Puckle, O. S., Time Bases (Scanning Generators), (B)2492
Pugh, E. M., N. Rostoker and A. Schindler, Hall effect in ferromagnetic materials, 620
—— with N. Rostoker, Hall effect in ferromagnetic materials, 2163
Pullen, K. A., use of G curves in pentode-circuit design, 826
Pulling, M. J. L., television, B.B.C. Lime Grove studios, 758, Calais/London relay, 459
Pulsford, E. W., with E. H. Cooke-Yarborough, counting-rate meter, of high accuracy, 2258, logarithmic, covering wide range, 2258
Pumphrey, R. J., upper limit of frequency for human hearing, (D)2322
Pungs, L., and H. Fricke, measurement of small angles of elevation of incoming metre waves, 432
Punnett, S. W., and H. G. Jerrard, precision electronic tachometer, 1730
—— with H. G. Jerrard, electronic tachometer, 177
Putilova, I. N., with others, formation of conducting bridges in suspensions, 2688

Q

Quate, C. F., with C. C. Cutler, space-charge and transit-time reduction of noise in electron beams, 1274
Quercia, I. F., with others, c.r.o. equipment for observation of transients, 165
Quillatre, H., insulating varnishes, 928

R

Rabin, B. M., and A. M. Strashkevich, trajectories of slightly deflected charged particles, 2794
Raburn, L. E., v.h.f.-u.h.f. tail-cap aerial, 2651
Racker, J., microwave aerials, 824
Radcliffe, F. E., wide-band swept-frequency measurements for travelling-wave valves, (A)1958
Radio Corporation of America, Laboratories Division, sampling principles of dot-sequential system, 464
Radio Research Board, Valve and Circuit Noise, R.R.B. Special Report No. 20, (B)1808
Rado, G. T., R. W. Wright and W. H. Emerson, dispersion mechanisms in ferrites, 337
Raff, S. J., reflecting surface to simulate infinite conducting plane at microwave frequencies, (A)1958, 2354
Raisbeck, G., with R. L. Wallace, Jr, duality as guide in transistor-circuit design, 2369
Raistrick, W. G., phase-shift oscillators, 598
Rajchman, J., selective e.s. storage tube, 2064
Rakshit, H., noise from extraterrestrial sources, 1627
—— and N. L. Sarkar, simple method of producing wide-band f.m., 2857
Ramer, L. G., with others, comparison of absorption coefficients, (A)1811
Ramsey, N. W., measurements of resistivity of insulators, 131
Ranc, G., with A. Colombani, crystallization of thin gold films, 2739
Randmer, J., with M. Knoll, grid-type image-storage c.r. tube, 786
Ranke, O. F., theory of action of cochlea, 1051
Rantzen, H. B., F. A. Peachey and C. Gunn-Russell, design of automatic monitors for broadcasting programmes, 1491
Rao, B. R., ultrasonic velocity measurement in liquids, 11
Rapoport, A., some biological applications of random nets, (A)2245
Ratcliffe, J. A., with others, diffraction by irregular screen, and ionospheric reflection, 428; ionospheric propagation of low- and very-low-frequency waves, 2522
Ratheiser, L., grounded-grid disk-seal valves as dm-λ oscillators, 1280
Rauch, L. L., with M. H. Nichols, radio telemetry, 1978
Randorf, W., electronic ram, 2788
Rawcliffe, G. H., rationalization of electrical units and M.K.S. system, 322
Rawer, K., approximate world distribution of F_2-layer ionization, 1379; prediction of s.w. propagation conditions based on ionosphere observations, 2812
—— with M. Barré, ionosphere observations, in Adélie Land, 112, in *Commandant Charcot*, 2997
—— with R. Gallet, long-term relation between F_2-layer ionization and solar activity, 1149
—— with L. Huber, 'best' pulse receiver, 1866
—— with others, radio propagation between Noumea and Adélie Land, 1231; world-wide F_2 ionization, 634
Rawson, H., theory of stresses in glass butt seals, 3032
Raymond, F. H., coding of multiplex transmission, 2833
Rayner, G. H., effect of earth admittances in a.c. bridges, (D)1433
—— and L. H. Ford, stability of N.P.L. mica standards of capacitance, 2938
Reagan, M. E., with others, field tests of microwave multiplex system, 1243
Reber, G., motion in solar atmosphere deduced from radio measurements, [illegible]
Reddick, H. W., Differential Equations, (B)149
Reddish, W., dielectric properties of polyethylene terephthalate (terylene), 367
Reed, C. W., end-window α-scintillation counter, 1220
Reed, W. O., with others, low-reflection picture tubes, 1501
Reeves, F. E., electrical timing devices, 226
Regener, E., H. K. Paetzold and G. Pfotzer, vertical distribution of ozone, 1376
Regener, V. H., vertical distribution of atmospheric ozone, 1640
Regenstreif, E., e.s. electron lens, with elliptical central electrode, 2793, with thick central diaphragm, 1455, 1742, 3-electrode-type, 2500
Rehler, K. M., Raytheon selection matrix for computer and switching applications, (A)2220
Reich, E., definition of information, 2273
Reich, H. J., and others, effect of auxiliary current on transistor operation, 2591; operation of split-anode magnetron, 1120
—— with P. M. Schultheiss, transistor trigger circuit, 2661
Reichardt, W., radiation characteristics of rectangular horns for H-mode waves, 1843
—— with M. Päsler, Fourier spectrum of forced oscillations due to step and needle impulses, 68
Reiffel, L., passive pulse-sharpening circuits, 2375
Reiling, P. A., waveguide filters for pulse transmission studies, 2104
Reisner, J. H., and E. G. Dornfeld, small electron microscope, 965
—— and S. M. Zollers, permanent-magnet electron microscope, 1457
Reitan, D. K., and T. J. Higgins, calculation of capacitance of cube, 1623
Remeika, J. P., with B. T. Matthias, dielectric properties of $NaNbO_3$ and $KNbO_3$, 3023
Renton, R. N., Telecommunications Principles, (B)2884
Rettinger, M., a.c. magnetic erase heads, 2630; magnetic recording and reproducing head, 807; television studio acoustics, 2297
Revell, R. S. M., and A. W. Agar, focusing in electron microscopy, 1218
Reverdin, D. L., electronoptical investigation of space charge in cut-off magnetron, 1988
Reyner, J. H., Testing Radio Sets, (B)1204
Reynolds, L. W., with others, mechano-electronic transducer for physiological applications, 2791
Rheaume, R. H., coaxial power tetrode for 50-kW output up to 110 Mc/s, (A)2304
Rhodes, D. R., slot-aerial developments, 2922; theory of cylindrical aerials with axial slits, 821
Riblet, H. J., current distributions on large reflecting cylinders, (A)2685
Richards, C. E., and others, properties and tests of magnetic powders, 1948
Richardson, A. S., Jr, application of remainder theorem to operational-calculus techniques, 677, (C)2219
Richardson, E. G., atmospheric turbulence and sound propagation, 267
Richardson, L. F., scattering of e.m. waves by atmospheric turbulence, (D)1755
Richmond, J. C., with C. C. Gordon, thickness gauges for ceramic coatings, 696
Richter, H., Fortschritte der Funktechnik und ihrer Grenzgebiete, Vol. 7/8, (B)1288
Riddiford, L., air-cored synchrocyclotron for 400-MeV protons, 1982; conference on vacuum physics at Birmingham, 1950, 641; gas scattering in particle accelerators, 1446
Rideau, G., method for study of perturbations of limited duration, 2136
Rider, J. F., Vacuum-Tube Voltmeters, (B)3066
—— and S. D. Uslan, Encyclopedia on Cathode-Ray Oscilloscopes and their Uses, (B)2491
Ridler, D. S., with G. H. Hough, multicathode gas-filled counter tubes, 784
Ridout, M. S., with E. Billig, height of potential barrier in contact rectifiers, 3153
Riebman, L., distortion in linear passive networks, 2676; oscillator frequency indeterminancy, (A)2122
—— with J. Broomall, sampling analogue computer, (A)2220
Riety, P., sound-field regulator, 2628
Rigby, E. C., with others, diffraction errors in optical investigation of aerial pattern, 2110
Righini, G., and G. Godoli, physical significance of solar character figures, 862
Ril', N., and G. Ortman, ZnS-Cu phosphors, 124
Ringrose, J., with A. D. Booth, flip-flop circuit with three stable states, 2367, (D)2937
Rinia, H., Schmidt optical system, 82
Rispoli, B., with others, c.r.o. equipment for observation of transients, 165
Rittner, E. S., with others, Fermi levels in semiconductors, 906
Robb, D. D., with V. P. Hessler, generalized electrical formulae, 2405
Robeer, A. G., and W. L. Vervest, automatic electrical tuning of large transmitters, 765
Roberson, R. E., random noise in attenuating fluid medium, 2311
Roberts, B. W., Jr, K. E. Perry and R. G. Fluharty, measurement of resolving time of counters, 715
Roberts, E. B., with A. M. Weber, 1950 world isogonic chart, 1893
Roberts, F., with J. Z. Young, flying-spot microscope, 1733
Roberts, M. H., electrical control of furnace temperature, 1734
Roberts, S., and F. E. Williams, theory of luminescence of sulphide phosphors, 646
Robertson, G., with T. J. Higgins, theory of moving-coil fluxmeter, 944
Robinson, D. W., anechoic chamber for acoustic measurements, 2088
Robinson, F. N. H., travelling-wave valves with dispersive helices, 2581
Rocard, Y., absorption of sound in fog, 2614; acoustic waveguides, 1290; Électricité, (B)2981; mechanism of coronal r.f. radiation jumps, 1360; possibility of true mechanical transformer, 2623
Rockafellow, S. C., thyratron circuit for timing machine operations, 956
Roddam, T., square-law rectifier voltmeter, 3052
Rodgers, E. H., with others, magnetic-field measuring instrument, (A)2226
Rodionov, S. F., and A. L. Osherovich, secondary-electron photon counter, 2509
Rodwin, G., LD-RI s.s.b. radio receiver, 2266
Roe, J. H., Genlock for television programming, 2294
Roessler, E., nonlinear distortion in loudspeakers, 556
Rogers, J. D., H. L. Cox and P. G. Braunschweiger, frequency meter for microwave spectroscopy, 1723
Rogers, T. A., and W. C. Hurty, shunt-motor servo with inertia load, 1249
Rogers, T. F., Van Vleck-Weisskopf equation for atmospheric microwave absorption, (A)2685
—— and S. J. Johnson, magnetic effects on Ni acoustic delay line, 642, (A)2100
—— with J. V. Harrington, signal/noise improvement by integration in storage tube, 732
—— with R. E. Nienburg, storage tube as amplitude distribution analyser, (A)2226
Rogozinski, A., with others, logarithmic amplification of weak currents using diodes, 2228
Rohde, L., H. Nitsche and A. Pfefferl, high-power f.m. broadcasting transmitters, 764
Roi, N. A., electromechanical oscillations in $BaTiO_3$ ceramics, 2449
Roizen, S., with others, evaporation in vacuo by direct bombardment, 3029
Romann, P., reading errors with McLeod gauge, 1159
Romanova, O. V., with V. L. Patrushev, design of Π-type cavity resonator, 2386
Romanow, F. F., with others, American Standard Z24.4-1949, pressure calibration of laboratory-standard microphones, 19; American Standard Z24.9-1949, coupler calibration of earphones, 21
Romeijn, F. C., with others, controlled-valency semiconductors, 905
Romell, D., radio reflections from Hg-arc discharge, 1618
Rooksby, H. P., and E. G. Steward, BaO-W cathode interface compounds, 2053
Roop, R. W., damping effects of porous absorbing units in rooms, (A)1811
Roorda, J., grounded-grid amplifier, 845
van Roosbroeck, W., theory of flow of electrons and holes in Ge and other semiconductors, 377
—— with others, carbon and borocarbon pyrolytic film resistors, 2365
Roosdorp, H. J., regulation of industrial processes, 2242
Roques, R., television on tour, 460
Roquet, J., isothermal remanence of finely granulated magnetite, 1671
Röschlau, H., high-sensitivity h.f. noise-measurement apparatus, 2487
Rose, A. S., stainless steel for television c.r. tubes, 136
Rosen, P., with G. W. Stuart, Jr, cylindrical cavity resonator with d.c. discharge, 1595
Rosencrans, C. A., polarity diplexing in microwave relay systems, 3118
Rosenfeld, L., Theory of Electrons, (B)2962
Rosenthal, J. E., correction of spot distortion in c.r. tubes, 1806
Rosenthal, L., amplitude stabilization of oscillators by nonlinear networks, (A)2122
Rosenthal, L. A., and H. S. Żablocki, electronic differential a.c. voltmeter, 689
Ross, A. H., with S. H. Van Wambeck, performance of diversity receiving systems, 2268
Ross, A. W., visibility of radar echoes, 1653
Ross, S. J., v.h.f. and u.h.f. radio links in Australian P.O. communication network, 1778
Ross, W., E. N. Bramley and G. E. Ashwell, direction of arrival of ionospheric waves, 2804
—— with E. N. Bramley, measurements of direction of arrival of short radio waves, 3091
Rossel, J., with H. Ess, properties of diamond and crystal counter, 424
Rostoker, N., and E. M. Pugh, Hall effect in ferromagnetic materials, 2163
—— with others, Hall effect in ferromagnetic materials, 620
Roth, M. S., performance tests for vibrator power supplies, 1792
Rothauge, C. H., and F. Hamburger, Jr, measurement of equivalent-circuit constants of quartz crystals, 392
Rothe, H., valve development at Telefunken since 1945, 2574
—— W. Engbert and H. Kraft, u.s.w. transmitting valves, 2872
Rothlein, B. J., high-conductance crystal diode, 2588
Rotow, A. A., with R. B. Janes, light-transfer characteristics of image orthicons, 481
Roubine, É., e.m. field of helix, calculation of, 1350, general expression for, 2978; waves guided by helical circuits, 2691
Rougerie, P., lunar diurnal variation of geomagnetic field at Val Joyeux, 353
Rouland, R., luminescence of c.r. tube screens, 1922
Roulston, K. I., differential pulse-height analyser, 578
Rouse, G. F., with R. Forman, oxide-cathode base-metal studies, 1527
Rousseau, J., cathode-coupled frequency changer, 2817; high-fidelity receiver using modern valves, 440, 962; 1951 components exhibition, Paris, 2672
Routly, P. M., with others, electrical conductivity of ionized gas, 335
Royden, G. T., suppression of harmonics in radio transmitters, 3144
Roys, C. S., with others, radiation from circular current sheets, 31
Roys, H. E., with others, methods of calibrating frequency records, 533
Rozenberg, L. D., focusing of sound waves by parabolic reflector, 2315
Rozentsveig, I. Yu., with A. R. Shul'man, secondary electron emission from Al_2O_3, 2569
Ruch, E., effect of diaphragm on field of e.m. wave in tube, 564
Rudd, J. B., v.h.f. transceiver for small aircraft, 763
Rudenberg, H. G., pulse transformer considered as wide-band network, (A)2122
Rüdenberg, R., nonharmonic oscillations due to magnetic saturation, 67
Rudmose, W., record-rerecord test for rooms, (A)1811
—— and H. Mims, equipment for field measurement of reverberation times, (A)1811
Rueger, L. J., R. G. Nuckolls and H. Lyons, microwave spectroscopy, with application to chemistry, nuclear physics and frequency standards, (A)1958
Rueggeberg, W., with J. B. Whitehead, h.f. dielectric-loss measurement with changing temperature, 151
Ruhrmann, A., exponential line at cut-off and in stop range, 2338
Rumbaugh, L. H., and L. R. Alldredge, airborne equipment for geomagnetic measurements, 1442
Rumsey, V. H., design of frequency-compensating matching sections, 300; transmission between elliptical-polarization aerials, 2346
Runcorn, S. K., stellar magnetic fields and rotation, 107
—— and others, experimental determination of geomagnetic radial variation, 351
Rundquist, E. C., with H. A. Taylor, R.C.A. frequency-measurement installation, 1965
Runge, W., u.s.w. R/T technique, 2538
Rust, H. H., electroacoustic transformation by magnetostriction and radiation from transformers, 2318; heavy-duty quartz ultrasonic generator, 2885; suspensions of ferromagnetic particles as substitutes for powder cores, 2749; ultrasonic generation by volume magnetostriction, 2612
Rust, N. M., h.f. surface-wave transmission line, 563
Rusterholz, A. A., Elektronenoptik, (B)1751
Ruston, J., crystal discriminator for f.m.-oscillator stabilization, 3145; transmission-amplitude characteristic of television transmitter, (A)2226
Rutishauser, H., A. Speiser and E. Stiefel, programme-controlled digital computers, 2221
Ruze, J., metal-plate lens, research at A.F.C.R.L., (A)2642, wide-angle, (C)2652; minimum side lobes in broadside arrays, (A)2100
—— and M. Young, measurement of reflection coefficient of metal-plate structures, 1880
Ryan, W. E., with others, evaluation of coaxial-slotted-line impedance measurements, 1963
Rydbeck, O. E. H., Kiruna ionospheric and radio propagation observatory, 1380; magneto-ionic triple splitting of ionospheric waves, 1147, 2427, theory of, 2714
—— and S. K. H. Forsgren, theory of electron-wave tubes, 2866
Ryder, E. J., and W. Shockley, electron mobilities in Ge for strong electric fields, 1398
Ryder, J. D., Electronic Fundamentals and Applications, (B)2883
Ryder, R. M., with J. A. Morton, design factors of Type-1553 triode, 510
Ryle, M., radio astronomy, 2698
—— and A. Hewish, effects of ionosphere on r.f. galactic radiation, 1634

S

Sacasa, R. G., sunspots and propagation prediction, 2813
Sacerdote, G. G., and A. Gigli, sound absorption by resonant panels, 2325
—— with A. Bressi, recording nonlinear distortion, 1834
—— with M. Ferrero, sound transmission parameters for granular absorbing materials, 16
Sack, B., with H. A. Sack, Hertzian oscillator and application to organic analysis, 3074
Sack, H. A., and B. Sack, Hertzian oscillator and application to organic analysis, 3074
Safa, E., circuits and measurement apparatus for 30-cm band, 2479
Sage, B. H., with others, predicting phase behaviour with digital computers, (A)1748
Sage, M., with C. Guillaud, magnetic properties and structure of Fe_2O_3. ZnO, 1401
Saha, N. K., B. S. Chandersekhara and M. K. Sundaresen, simple voltage stabilizer for G-M counters, 228
Saic, F. C., propagation of metre waves, 1229
Saksena, B. D., piezoelectric constant of ZnS, 1924
Salinger, H., with S. Nevin, secondary emission surfaces exposed to oxide-coated cathodes, 2056
Salisbury, F. L., with others, klystron amplifier for u.h.f. television, (A)2304
Salomonovich, A. E., with L. N. Borodovskaya, measurement of oscillation amplitude of quartz crystals, 2774
Salow, H., Ge triodes in l.f. and m.f. amplifiers, 2958; solar and terrestrial phenomena during sudden ionospheric disturbance 19th Nov. 1949, 885
Salpeter, J. L., physical basis of wave filter, 621
Salz, N. P., with others, Ge diode as video detector, 2589
Samuel, E. W., and R. S. Shankland, sound field of Straubel X-cut crystal, 5
Samulon, H. A., spectrum analysis of transient-response curves, 1856
Sandretto, P. C., ρ-θ system of air navigation, 1158
Sanford, R. L., and P. H. Winter, permeameter for magnetizing forces up to 300 oersted, 157
Sanner, H. G., spectral sensitivity of Se photocells, 769
van Santen, J. H., and G. H. Jonker, conductivity of ferromagnetic compounds of Mn, 656
Saraga, W., wide-band 2-phase networks, 1104
Sarginson, K., with D. K. C. MacDonald, size effect in conductivity of metals, 328
Sarkar, N. L., with H. Rakshit, simple method of producing wide-band f.m., 2857
Sasas, E., linearization of f.m. characteristic, 496
Saunders, R., Jr, with L. E. Swedlund, e.s.-focusing picture tube, 2560
Saunders, R. M., dynamoelectric amplifiers, 48; Class A operation of, 529
Sauter, F., statistical theory of electron multiplier, 1028
Savitt, J., recombination in F region during solar eclipse, 20th May 1947, 886

Saxon, D. S., with others, propagation in coaxial structure with two dielectrics, **1564**
Saxton, J. A., field-strength meter for 600 Mc/s, **(A)1958**
Saxton, J.A., and H. G. Hopkins, adverse effects of meteorological factors on marine radar equipment, **1228**
Sayer, W. H., Jr, and E. Mehrbach, parallel operation of valves at u.h.f., **(A)2292**
Sayle, E. A., with R. B. Owen, scintillation counting equipments, **2258**
Scaff, J. H., with W. G. Pfann, p-type Ge transistor, **508**
—— with H. C. Theuerer, effect of heat treatment on Ge, **2201**
Scal, R. K. F., with others, new techniques for miniaturization, **307**
Scarborough, J. B., Numerical Mathematical Analysis, **(B)1957**
Schaafs, W., generation of intense electron flashes, **3069**
—— and F. Trendelenburg, X-ray investigation of sound waves due to dielectric breakdown, **86**
Schachenmeier, R., influence of troposphere on u.s.w. propagation, **2524**
Schade, O. H., image structure and transfer characteristics in television, **2293**
Schaetti, N. See Schätti, N.
Schäfer, E., measurements on ring-gap magnets, **943**
Schafer, J. P., with W. J. Albersheim, echo distortion in f.m. transmission of frequency-division multiplex signals, **(A)2265**
Schafer, T. H., P. O. Thompson and J. C. Webster, masking of pure tone at gap in thermal-noise spectrum, **(A)544**
Schaffner, H., simultaneous oscillations in oscillators, **(A)2122**
Schaffner, J. S., with H. von Foorster, principles in production of sub-millimetre waves, **(A)2122**
Schaffner, M., and G. Toraldo di Francia, evanescent microwaves generated by diffraction, **1354**
Schaffstein, G., with others, development of commercial receivers, **2529**
Schagen, P., mechanism of high-velocity target stabilization in image iconoscopes, **3137**
Schätti, N., non-storage scanning tube for films, **482**; secondary-electron multipliers, **2868**
—— and W. Baumgartner, photoeffect in alkali/Ge compounds, **364**
—— with W. Baumgartner, photoelectric effect for Cs-O, Cs-S, Cs-Se and Cs-Te photocathodes, **1797**
Schatz, E. R., and E. M. Williams, pulse transients in exponential transmission lines, **280**, **(C)1069**
—— with E. M. Williams, design of exponential-line pulse transformers, **1301**
Schedling, J. A., with F. Blaha, display of lines of magnetic force by glow discharge, **1348**
Scheldorf, M. W., new communications aerial, **823**
Schelkunoff, S. A., Kirchhoff's formula and other field-equivalence theorems, **2962**; wave propagation in stratified media, **3089**
Schérer, J., d.c amplifiers, **2684**
Schérer, M., and E. Vieille, propagation of discharge in G-M counters with external cathode, **710**
Scherzer, O., electronoptical apochromat, **182**
Schiff, L. I., with R. F. Post, statistical limitations on resolving time of scintillation counters, **967**
Schindelhauer, F., and E. A. Lauter, phenomena connected with Mögel-Dellinger effects, **1477**
Schindler, A., with others, Hall effect in ferromagnetic materials, **620**
Schirp, W., air-cooled variometer for s.w. transmitter, **2299**
Schlafly, H. J., comparison of television- and film-industry definitions of resolution, **1495**
Schlang, A., determination of critical servo gain, **2021**
Schleich, F., with E. Kinder, constant-current mains unit for electron-microscope lenses, **746**
Schlesinger, K., dot-arresting technique for dot-interlace transmission, **(A)2292**
Schlüter, A., cosmic radiation and magnetic fields, **2989**; dynamics of plasma, **2150**
Schmid, O., maximum permissible grid-leak resistance, **2683**
Schmid, P., and E. Baldinger, wide-band amplifier for c.r.o. observation of transients, **315**
Schmidt, K. O., directional aerials, **2352**; simple method of planning dm-λ links, **1245**
Schmidt, O., with H. Boucke, amplifiers with selective feedback, **1124**
Schmidt, T., with H. A. Bomke, ponderomotive effects of cm waves, **681**
Schmitt, G., and H. Schrag, double-humped resonance curves of repeaters, **1088**
Schneider, W. G., and G. J. Thiessen, velocity of sound in He, **515**
Schoenfeld, R. L., with others, instantaneous peak voltmeter, **2481**
Scholes, D. H. C., transmitter for British civil-aviation area-coverage network, **2545**
Scholes, W. E., with P. H. Parkin, speech-reinforcement systems, **1294**
Scholte, J. W. A., with W. C. van Geel, capacitance and dielectric losses of Al_2O_3 layer, **3022**
Schonland, B. F. J., The Flight of Thunderbolts, **(B)2718**
—— with D. J. Malan, electrical processes between strokes of lightning, **2182**
Schott, F. W., response of directive aerial to incoherent radiation, **2654**
Schott, L. O., electrical vocal system, **1058**
Schouten, J. F., with others, 48-channel carrier telephone system, **739**, **2013**
Schouten, J. P., fields associated with cavities in magnetically strained medium, **90**
Schover, D. S., with A. A. Gerlach, pulse-width discriminator, **2784**
Schrag, H., with G. Schmitt, double-humped resonance curves of repeaters, **1088**
Schreck, C., measurement of temperature coefficients of coils, etc., **2476**
Schröter, F., image-storage problems, **480**; c.r. picture telegraphy, **2551**
Schulman, J. H., and C. C. Klick, fluorescence of phosphorescence emission spectra of Zn_2SiO_4-Mn, **367**
—— with C. C. Klick, 'sub-bands' in the luminescence spectrum of Zn_2SiO_4-Mn, **647**
Schultes, H., with W. Graffunder, c.r.o. display of valve characteristics, **692**
Schultheiss, P. M., and H. J. Reich, transistor trigger circuits, **2661**
—— with others, effect of auxiliary current on transistor operation, **2591**
Schultz, W., energy loss from fast electrons, **2792**
Schulze, A., physical properties of SiC below 1000°C, **1680**
Schumann, W. O., e.m. oscillations in plasma, **717**, **853**; slow e.m. waves in gas-filled metal tubes, **1303**
Schunack, J., transmission bandwidth and television picture quality, **493**
Schuster, N. A., phase-sensitive detector circuit, **2780**
Schüttlöffel, E., with others, directive aerials for s.w. angle-of-incidence measurements, **434**
Schutzenberger, M. P., relation between quantity of information in Fisher and in Wiener sense, **1769**
Schwartz, E., sharpness of television pictures, **2025**
Schwartz, L. S., error reduction in determination of electronic system parameters, **(A)2270**
Schwartz, R. F., with L. L. Koros, transistor frequency-modulator circuit, **3147**
Schwinger, J., with N. Marcuvitz, representation of electric and magnetic fields in waveguides, **2638**
Scott, G. D., with others, electron-microscope observations on formation of evaporated metal films, **659**
Scott, J. C. W., computation of ionospheric propagation, **720**; gyro-frequency in arctic E layer, **2001**; longitudinal and transverse propagation modes in Canada, **1471**; Poynting vector in ionosphere, **193**
Scott, N. R., stability of oscillations in nonlinear system, **(A)2122**
Scott, R. E., network synthesis applied to feedback control, **(A)2122**
Scott, T. R., crystal triodes, **2592**
Scroggie, M. G., design of wobbulator for simple c.r.o., **412**; Radio Laboratory Handbook, **(B)3065**; sensitive null-detector amplifier, **2390**
Scudder, R. M., design of Bridgeport u.h.f. television aerial, **284**
Seaman, E. C. H., D. A. Crow and C. G. Chadburn, piston attenuator for cable testing in range 1–30 Mc/s, **1709**
Seeberger, L. N., with A. H. Benner, graphechon writing characteristics, **3182**
Seegar, K., with others, electron emission from metal surfaces as after effect, **3151**
Seeger, C. L., observations of 205-Mc/s radiation of Cygnus A, **2703**
Seely, S., with others, radiation from circular current sheets, **31**
[illegible], E., frequency response of output transformer with filter coupling, **2683**
Seigle, R. K., with R. L. Kuehn, rack-mounted flying-spot scanner, **2846**
Seitz, F., influence of plastic flow on alkali halide crystals, **129**; theory of semiconductor resistance in magnetic field, **612**
Selby, M. C., High-Frequency Voltage Measurements, **(B)1974**
van Seldam, C. A., with A. Michels, influence of inductances on determination of capacitances, **1961**
Selényi, P., electrical flywheel and electron inertia, **2967**
Sell, W. B., and J. V. Lebacqz, microwave oscillograph, **(A)1958**
Selz, J., and A. de Leudeville, C.I.T. wave analyser, **3057**
Seman, O. I., optical strength of short electron lenses, **2795**
Sen, A., with S. R. Khastgir, frequency variation of intensity of atmospherics from distant sources, **1387**
Sen, S. N., u.h.f. absorption, in organic liquids at different temperatures, **1356**, in substituted benzene compounds, **2162**
Sennett, R. S., with others, electron-microscope observations on formation of evaporated metal films, **659**
Sepmeyer, L. W., equipment for sound measurement and analysis, **(A)1811**
Seright, C. G., measurement of receiver radiation, **2006**
Sette, D., ultrasonic lenses of plastic materials, **1292**
Severin, H., diffraction, of cm waves by metal disks, **2412**, of e.m. waves, theory of, **2694**
—— and W. v. Baeckmann, diffraction of cm waves by disks, **2693**
Sewell, D., design of bevatron magnet, **(A)179**
Seymour, P. W., equalizer curves for design of 2-terminal networks, **2372**
Seymour, R. A., simple phase-measurement circuit, **1724**
—— and D. G. Tucker, choke-coupled phase inverter of high accuracy, **[illegible]**
—— with D. G. Tucker, synchrodyne as precision demodulator, **204**
Shackelford, C. L., with H. F. Ivey, thermionic-emission calculations, **1877**
Shain, C. A., with F. J. Kerr, moon echoes and transmission through ionosphere, **2264**
Shankland, R. S., with E. W. Samuel, sound field of Straubel X-cut crystal, **5**
Shannon, C. E., and W. Weaver, The Mathematical Theory of Communication, **(B)455**
Shapiro, G., radio receiver subminiaturization techniques, **(A)2265**
—— with others, new techniques for miniaturization, **307**
Sharpe, J., and D. Taylor, counters and counting systems, **2258**
—— with W. R. Loosemore, time delays in l.v. halogen-quenched G-M counters, **2260**
—— with D. Taylor, ion chambers and ion-chamber instruments, **2258**
Shasherin, V. P., speed of recording c.r. traces by photography, **2768**
Shaull, J. M., and C. M. Kortman, chronograph and chronoscope for comparison of quartz clocks, **2471**
Shaw, E. A. G., variable-selectivity tunable a.f. amplifier, **600**
Shaw, I. J., ionospheric cross-modulation, **1472**
Shaw, R. C., and others, 6-channel mobile urban R/T system, **741**
Shaw, T. M., and J. J. Windle, microwave measurement of permittivity fibres, **686**
Shea, R. F., thyratron-operated photoelectric baseball umpire, **1211**
Sheldon, J. L., characteristics of all-glass television picture bulbs, **1795**
Shepard, F. H., Jr, saturable-reactor considerations, **1315**
Sheppard, G. E., M. Garbuny and J. R. Hansen, reflex resnatron, **(A)2304**
—— with M. Garbuny, reflex resnatron operation, **(A)2304**
Sheffield, B., filter design simplified, **2127**, **2946**
Sheridan, K. V., with V. D. Burgmann, microwave d.f. for aircraft navigation, **2189**
Shimmins, A. J., cathode-follower response to pulse and sawtooth signals, **846**; quiescent voltages and currents in pentode amplifiers, **77**
Shinn, D. H., with others, diffraction by irregular screen, and ionospheric reflection, **428**
Shirane, G., S. Hoshino and K. Suzuki, X-ray study of phase transition in $PbTiO_3$, **927**
Shmoys, J., definition of virtual height, **(A)2712**; diffraction of e.m. waves by plane wire grating, **2966**
Shockley, W., Electrons and Holes in Semiconductors, **(B)2463**
—— M. Sparks and G. K. Teal, p-n junction transistors, **3177**
—— with J. R. Haynes, mobility and life of injected holes and electrons in Ge, **1928**
—— with E. J. Ryder, electron mobilities in Ge for strong electric fields, **1398**
—— with others, theory and experiment for Ge p-n junction, **1669**; nucleation and magnetic properties of alnico V, **657**; velocity of propagation of ferromagnetic domain boundary, **855**
Shone, A. B., variable-filter tuning, **733**
Shorter, D. E. L., design of loudspeaker cabinets, **809**; influence of high-order products on nonlinear distortion, **2892**, **(D)2893**, **(D)2894**
—— with H. D. Harwood, high-level noise source for a.f. band, **25**
Shrader, R. E., with S. Larach, cathodoluminescence of Zn_2SiO_4-Mn, **1921**
Shteinshleiger, V. B., phenomena in e.m. resonators near natural frequency, **1863**
Shturkin, D. A., and Ya. S. Shur, magnetostriction hysteresis in alnico and vicalloy, **2733**
Shul'man, A. R., currents producing radio valve noise, **2877**
—— and I. Yu. Rozentsveig, secondary electron emission from Al_2O_3, **2569**
Shulman, C., quantum effects in interaction between free electrons and e.m. fields, **2149**
Shulman, I., with S. Heller, Television Servicing, **(B)495**
Shumard, C. C., design of filters using RC networks and d.c. feedback amplifiers, **1325**
Shunaman, F., colour-television systems, **1787**
Shur, Ya. S., with D. A. Shturkin, magnetostriction hysteresis in alnico and vicalloy, **2733**
Shura-Bura, M. P., probable error in solution of finite-difference equation for electrical networks, **2942**
Sieffert, L. E., with others, effects of contaminants on electrical insulation, **130**
Siegert, A. J. F., first-passage-time probability problem, **1694**
Silleni, S., ionosphere data deduced from radiotelegraphy tests in Italy, **1754**
Silsbee, F. B., N.B.S. standards for electrical measurements, **2227**
Sim, A. C., generalization of reversion formulae and application to nonlinear differential equations, **2217**
Simmons, A. J., wide-band microwave quarter-wave plate, **(A)2100**
Simmons, L. M., with others, resistance/temperature relation for thermistors, **1083**
Simon, J. C., with J. Ortusi, diffraction by paraboloids of revolution, **820**
Simpson, J. A., Jr, change of cosmic-ray neutron intensity following solar disturbances, **1635**
Simpson, J. H., static dielectric constant of dipolar solids, **2195**
Sinclair, D. B., with A. Peterson, single-ended push-pull audio amplifier, **(A)2062**
Sinclair, G., patterns of aerials located near elliptical cylinders, **2649**; transmission and reception of elliptically polarized waves, **(C)285**
Singer, S. F., E. Maple and W. A. Bowen, Jr, evidence for ionosphere currents from rocket experiments, **2713**
Singleton, H. E., digital electronic correlator, **1237**; optimum nonlinear filters, **(A)2122**
Sittkus, A., solar and terrestrial phenomena during sudden ionospheric disturbance 19th Nov. 1949, **885**
Skalnik, J. G., with others, effect of auxiliary current on transistor operation, **2591**; integration-noise reducer for radar, **360**; operation of split-anode magnetron, **1120**
Skaupy, F., Metallkeramik, **(B)1690**
Skeeters, R. N., sound ranging at Morris Dam torpedo ranges, **(A)116**
Skellett, A. M., and P. W. Charton, 30-element radial-beam switching tube with e.s. focusing, **1030**
Slade, B. N., transistor with wide-spaced contacts, **1803**
Slate, M. W., J. P. Van Duyne and E. G. Mannerberg, high-stability u.h.f. television tuner, **(A)2292**
Slater, J. C., Microwave Electronics, **(B)1540**
Slee, O. B., with G. J. Stanley, galactic r.f. radiation, **865**
Sleeper, M. B., F.A.S. a.f. system, **804**, **805**, **1332**
Slemon, G. R., radio interference from h.v. corona, **205**
Slobodskoi, L. I., with L. V. Kirenski, effect of directed stresses on shape of magnetization curve, **2408**
van Slooten, J., testing networks by unit-function response, **2235**
Sloughter, G. S., and R. T. Ellis, linear discriminator for f.m. telemetering, **2783**
Slusser, E. A., predicting performance of u.h.f. radiating systems, **2814**
—— with D. A. Miller, television-receiver noise calculations, **3142**
Smee, J. F., with others, field measurements on model betatron and synchrotron magnets, **699**
Smerd, S. F., r.f. solar radiation, **344**, polarization of, and sun's general magnetic field, **860**; solar r.f. data, **625**
—— and K. C. Westfold, r.f. radiation in ionized gas, and solar radiation, **[illegible]**
Smith, A. D. N., electronic instrument for measuring damping capacity, **2946**
Smith, C. E., performance of sectionalized broadcasting towers, **(A)2270**
Smith, C. P., phoneme detector, **2620**
Smith, D. C. G., with S. F. Pearce, narrow-pulse generator, **(D)2776**
Smith, E. J., observation of precipitation with airborne radar, **892**; transient response of self-saturating magnetic amplifiers, **(A)2122**
Smith, F. G., intensity fluctuations of r.f. galactic radiation, **1365**
Smith, F. W., network representation of amplifier admittances, **(D)2392**
Smith, H. M., determination of time and frequency, **2223**
Smith, J. B., with D. M. McCallum, logical computers, **2467**
Smith, J. J., and P. L. Alger, finite representation of impulse functions, **(A)2218**; Heaviside's operational calculus and Schwartz functions, **932**
Smith, L. G., magnetic electron multipliers for detection of positive ions, **2584**
Smith, M. C., R. E. Barrett and R. T. Beyer, ultrasonic absorption in $MgSO_4$ solutions, **(A)530**, **1549**
Smith, N. F., WOR television studios, New York, **1270**
Smith, N. S., performance tests on radio receivers, **1727**
Smith, P. D. P., field equations for regions of variable μ and ϵ, **858**
Smith, R. S., with M. J. Klein, thin ferromagnetic films, **1675**
Smith, R. W., with others, storage oscilloscope, **3055**
Smith-White, W. B., energy in electrostatics, **326**; thermodynamics of fluid dielectric, **1611**
Smoluchowski, R., with J. E. Goldman, theory of magnetic anistropy in alnico V, **369**
Smyth, H. T., R. H. Meinken and L. G. Wisnyi, high-temperature vacuum induction furnace, **3078**
Smythe, W. R., electric and magnetic forces between sphere and wire, **2140**; Static and Dynamic Electricity, **(B)2165**
Snoek, J. L., with H. G. Beljers, gyromagnetic phenomena in ferrites, **652**
Snow, D. L., with others, K-band amplifier klystron, **(A)2304**
Snyder, J., time-domain filters, **(A)2122**
Snyder, W., with others, measurement of polarization of l.f. ionosphere reflections, **(A)2799**
Snyder, W. F., with E. L. R. Corliss, calibration of audiometers, **1054**
Sobotka, H., with P. Kotowski, Drahtloser Überseeverkehr, **(B)2283**
Sochnev, A. Ya., optimum parameters of systems with permanent magnets, **2459**
Soderman, R. A., bolometer bridge for h.f. power measurement, **410**
—— and W. M. Hague, u.h.f. measurements with Type-874 LB slotted line, **1714**
Sokolov, A. V., with S. V. Vonsovski, surface photoelectric effect in ferromagnetics, **2401**
Solow, M., I. W. Hammer and P. H. Haas, noise-figure standards, **(A)2226**
Sommer, H., with R. A. Erickson, distortion correction for video delay lines, **52**
Sommer, J., high-Q dust-cored coils for 100 c/s–100 kc/s, **584**
—— with R. Gauger, bridge-stabilized generator for tuning musical instruments, **693**
Sondheimer, E. H., effect of transverse magnetic field on conductivity of thin metal films, **331**; theory of transport phenomena in metals, **327**
Sorrows, H. E., R. E. Hamilton and Ming S. Wong, precision coaxial resonant line for impedance measurements, **(A)1958**
—— W. E. Ryan and R. C. Ellenwood, evaluation of coaxial-slotted-line impedance measurements, **1963**
Sosin, B. M., directional couplers for v.h.f. amplitude-ratio and phase measurement, **1962**
Soulé-Nan, G., and J. Peltier, method of calculating certain integrals, **2917**
Souther, H. T., improved bass response in loudspeaker systems, **(A)2062**
Southworth, G. C., Principles and Applications of Waveguide Transmissions, **(B)1311**
Soutif, M., 1950 International Congress on r.f. spectroscopy, Amsterdam, **1355**
Sowton, C. W., and D. B. Balchin, new London R/T terminal, **2539**
Spandöck, F., from decentralized to central sound transmission, **1829**
Sparks, M., with others, Ge p-n junction, growth of single crystals containing, **1682**, theory and experiment for, **1669**
Spear, W. E., electron optics of e.s. focusing system, **1964**
—— with W. Ehrenberg, e.s. focusing system and application to fine-focus X-ray tube, **1450**
Speiser, A., with others, programme-controlled digital computers, **2221**
Spence, H. W., systematization of valve surveillance in computers, **3163**
Spence, M., with others, p-n-junction transistors, **3177**
Spence, R. D., and C. P. Wells, vector wave functions, **3035**
—— with A. Leitner, effect of circular ground-plane on aerial radiation, **567**
Spencer, D. E., separation of variables in e.m. theory, **2103**
Spencer, G. R., with others, five-digit parallel coder tube, **(A)2290**
Spencer, R. E., tuned absorption circuits, **62**
Spenke, E., rectifiers, crystal, with heavy d.c. bias, impedance of, **1582**, dry, distribution of impurity centres in, **994**
Spirer, H. F., relation of Nyquist diagram to pole-zero plots, **(D)2358**
Spitzer, E. E., rating of high-vacuum power valves, **1799**
Spitzer, L., Jr, with others, electrical conductivity of ionized gas, **335**
Spurck, R. F., with H. J. Nolte, metal/ceramic sealing using Mn/Mo mixture, **1410**
Squires, W. K., determination of amplifier sensitivity, **2478**
—— and K. R. Wendt, synchroflection deflection system, **(A)2292**
Srivastava, S. S., with E. E. Zepler, interelectrode impedances in triodes and pentodes, **2590**
Stahl, F. A., Ge trigger photocells, **3154**
Stahl, H. A., electron diffraction in valve technique, **1785**; poisoning of oxide cathodes by atmospheric sulphur, **2051**
Stahl, P. D., ultrasonics in loran trainer, **3008**
Stanley, G. J., and O. B. Slee, galactic r.f. radiation, **865**
Stanley, J. P., ionospheric reflection of long radio waves, **974**, **1474**
—— with H. A. Whale, group and phase velocities on magneto-ionic theory, **972**
Stannard, G., with others, portable repeater for broadcast programmes, **[illegible]**
Stanner, W., and H. C. Freiesleben, hyperbolic aerial-navigation systems, **1393**
Stansel, F. R., characteristics and applications of varistors, **2363**
Stansel, N. R., Induction Heating, **(B)2515**
Stanworth, J. E., Ni-Cr-Fe alloy for sealing to glass, **674**
Stark, H. J., with others, aging of plastics under various climatological conditions, **2453**
Stark, K. H., with V. Daniel, dielectric properties of ketones, **1941**
Staschover, L., and H. G. Miller, television-link sound diplexer, **3126**
Stefanizzi, A., radioactivity of snow and rain, **893**
Steigerwald, K. H., positive emission from thermionic cathode, **2570**
Stein, M., with H. S. Moore, comparison of ionospheric solar indices, **834**
Steinberg, E. B., with W. Espe, Al-clad iron for electron valves, **1949**
Steinberg, J. L., and S. Zisler, detection of solar r.f. radiation reflected by moon, **[illegible]**
—— with others, correlation of geomagnetic and solar activity, **2963**; interpretation of solar-noise jumps, **1359**; low-intensity solar radio storms, **1358**
Steinhaus, D. W., with others, suppression of parts of spark spectra, **3076**
Steinort, E., design of permanent-magnet systems, **1171**
Stephens, R. W. B., and A. E. Bate, Wave Motion and Sound, **(B)1562**
Stephenson, J. G., a.f.c. of mechanically tuned oscillators, **601**
Sterling, G. E., and R. B. Monroe, The Radio Manual, **(B)794**
Sterling, H. T., electronic filter, **(A)2122**; extended class-A audio, **2689**
Stetson, H. T., with G. W. Pickard, tropospheric reception at 44·1 and 98·1 Mc/s over 167-mile path, **977**, **(A)1287**
Stevels, J. M., power factor of glasses as function of composition, **3031**
Stevens, K. N., autocorrelation analysis of speech sounds, **(A)541**, **1056**
Stevens, R. F., and T. W. Stringfield, microwave applications to Bonneville Power Administration system, **1777**
Steward, E. G., with H. P. Rooksby, BaO-W cathode interface compounds, **2053**
Stewart, W. E., R.C.A. Type-RT-11A tape recorder, **2094**
Stiefel, E., and H. Ziegler, natural eigenvalue problems, **1176**
—— with others, programme-controlled digital computers, **2221**
Stiles, J. E., f.m. communication-system monitor for 30–175 Mc/s, **1972**
Stimson, A., and C. F. Taylor, design of log-scale d.c. meters, **399**
Stöckmann, F., theory of photoconduction in composite conductors, **84**; valence semiconductors, **2727**
Stoker, J. J., Non-Linear Vibrations in Mechanical and Electrical Systems, **(B)390**
Stone, W. R., with others, test-pattern generator for colour-television signals, **(A)2292**
Stoner, C. R., with A. W. Ladner, Short Wave Wireless Communication, **(B)2080**
Stoner, E. C., magnetization curves, **2680**
Storm, H. F., response of saturable reactor with resistive load, **(A)2983**
Stout, M. B., Basic Electrical Measurements, **(B)1973**
Stovall, J. R., transducers as sensing elements for servos, **2985**

Stowe, H. A., electronics for Sydney Water Board, **2276**
Stoyko, A., velocity of propagation of radio waves, **2803**
—— and N. Stoyko, diurnal variation of propagation time and frequency, **2802**
Stoyko, N., with A. Stoyko, diurnal variation of propagation time and frequency, **2802**
Strack, W., Jr, with others, 6-channel mobile urban R/T system, **741**
Straiton, A. W., and C. W. Tolbert, factors in v.h.f. wave propagation, **(A)2799**
—— D. F. Metcalf and C. W. Tolbert, tropospheric scattering of radio waves, **2811**
—— with C. W. Tolbert, phase-shift refractometer, **2472**
—— with others, attenuation of radio signals by scattering, **2525**
Straker, T. W., with others, ionospheric propagation of low- and very-low-frequency waves, **2522**
Strandberg, C. F., process for resharpening recording styli, **2903**
Strans, D., ionosphere during solar eclipse, April 1949, **2996**; properties and origin of D layer, **878**
Strashkevich, A. M., with B. M. Rabin, trajectories of slightly deflected charged particles, **2794**
Strassner, R. M., gas-diode electronic organ, **1445**
Strauss, R., new ratiometer for electron microscope, **1217**
Street, R., antiferromagnetism, **2977**
—— and P. D. Whitaker, power measurement for 3-cm and 10-cm waves, **168**
Stringfield, T. W., with R. F. Stevens, microwave applications to Bonneville Power Administration system, **1777**
Strum, P. D., mixer-crystal checker, **1200**
Strutt, M. J. O., new methods of h.f. voltage measurement up to 10 kMc/s, **2761**; properties and applications of ferrites and other ferromagnetic materials, **912**
Stuart, G. W., Jr, and P. Rosen, cylindrical cavity resonator with d.c. discharge, **1595**
Stüber, C., use of dummy reflecting objects in anti-radar technique, **358**
Stuetzer, O. M., German development of artificial-dielectric microwave delay lenses, **37**
Stull, K. S., radar test generator, **2489**
Stumpers, F. L. H. M., first-passage-time problem, **1127**
Stuntz, S. E., sound intensity level and judgment of tonal range, **(A)536**, **2891**
Sturley, K. R., Frequency Modulation, **(B)991**
Sturrock, P. A., focusing of electron beams in magnetic fields, **964**
Styles, R. S., prevention of echo interference in double-pulse systems, **3007**
Suart, R., design of low-power valves for v.h.f. and u.h.f., **2065**
Suchet, J., with N'Guyen Thien-Chi, thermistors, **44**
van Suchtelen, H., introduction to application of ferroxcube, **2204**
Sueur, R., F. Job and F. Le Guen, level regulation on Paris-Toulouse coaxial cable, **2832**
Sultanoff, M., 10^6-frames/sec camera, **747**
Sulzer, P. G., bridged-T network, **2943**; tuning systems using feedback amplifiers, **1869**
—— with others, polar vector indicator, **166**
Summerlin, F. A., compensation of zero-drift errors in direct-coupled feedback systems, **1867**
Sundaresen, M. K., with others, simple voltage stabilizer for G-M counters, [illegible]
Supper, J. B., overtone crystals and maintaining oscillators, **2382**
Surugue, J., Techniques Générales du Laboratoire de Physique, Vol. 2, **(B)1174**
Susskind, C., artificial dielectrics of obstacle type, **(A)2100**; characteristic impedance of shielded coils, **2118**
Sutton, H. J., tuning equipment for carrier-current power-line installation, **211**
Suzuki, K., with others, X-ray study of phase transition in PbTiO$_3$, **927**
Svartholm, N., focusing of charged particles in crossed e.m. and e.s. fields, **704**
Svensson, R., experimental investigation of electron orbits in magnetron, **3186**
Sveshnikov, A. G., radiation principle, **2518**
Swallow, J. C., with S. de Walden, aural-null and twin-channel c.r. direction finders, **(D)118**
Swann, W. F. G., electrets, **608**
Swarm, H. M., generation of s.s.b. suppressed-carrier signals, **(A)2270**
Swedlund, L. E., and R. Saunders, Jr, e.s.-focusing picture tube, **2560**
—— and C. W. Thierfelder, projection kinescope 7NP4 for theatre television, **2851**
Sweet, P. A., effect of turbulence on sun's magnetic field, **101**
Swengel, R. C., with others, ultrasonic measurement of water velocity, **416**
Swern, L., microwave techniques for 28–300 kMc/s, **(A)1958**
Szegho, C. S., colour c.r. tube with three phosphor bands, **1002**
—— and T. S. Noskowicz, electron-gun ion traps, **3183**
—— M. E. Amdursky and W. O. Reed, low-reflection picture tubes, **1501**

T

Tabor, L. P., aircraft and airport traffic characteristics, **(A)2186**
Taeger, W., Wien bridge as phase-shift element of RC oscillator, **597, 842**
Taft, E. A., with J. E. Dickey, photoelectric changes in SrO and BaO due to ultraviolet irradiation, **365**
Taft, V. A., synthesis of quadripoles with specified parameters, **57**
Tager, P. G., electron-optical sound-recording device, **1838**
Taglang, P., with A. J. P. Meyer, ferromagnetism, of alloy FeBe$_2$, **2203**, of Co/Zn alloys, **2735**; magnetic properties of Cu in solid solution in Co and in Fe/Ni alloy, **655**
Tai, C. T., effect of grounded slab on radiation from line source, **2108**
Taieb, J., voltage regulation for Van de Graaff generators, **1000**
Tait, A., with others, source of error in radio phase-measuring systems, **(D)2433**
Takamura, T., with M. Oda, solar noise at 3·3 kMc/s, **2984**
Takayama, K., with S. Kojima, noise temperature of d.c. gas-discharge plasma, **1133**
Talbot, S. A., and others, mechano-electronic transducer for physiological applications, **2791**
Talley, D., emergency equipment for linking radio and line circuits, **2018**
Tamarkin, P., G. L. Boyer and R. T. Beyer, experimental determination of acoustic wave fronts, **(A)517, 1547**
Tan Soen Hong, with others, influence of initial phase in nonlinear circuits, **2673**
Tanner, J. A., and B. G. V. Harrington, frequency-compensated direct-coupled amplifier for pen-recorder, **1603**
Tanner, R. H., master control facilities for large studio centre, **(A)2270**
Tanner, R. L., improvement of loudspeaker response by motional feedback, **1835**; theoretical limitations to impedance matching, **1566**
Tarbès, P., scanning tubes with transparent signal-plate, **479**
Tasny-Tschiassny, L., extension of Thévenin's theorem, **297**
Taub, A. H., and N. Wax, theory of planar diode, **777, (C)1800**
Taylor, C. F., with A. Stimson, design of log-scale d.c. meters, **399**
Taylor, D., and J. Sharpe, ion chambers and ion-chamber instruments, **2258**
—— with W. R. Loosemore, temperature dependence in G-M counters, **(D)187**
—— with J. Sharpe, counters and counting systems, **2258**
Taylor, G., with P. Pluvinage, measurements of atmospheric electric field in Greenland, **1153**
Taylor, H. A., and E. C. Rundquist, R.C.A. frequency-measurement installation, **1965**
Taylor, J. H., pressure dependence of resistance of Ge, **1161**
Taylor, N. H., marginal checking as aid to computer reliability, **1185**
Taylor, T. T., aerial pattern synthesis methods and energy storage considerations, **(A)2642**
—— and J. R. Whinnery, applications of potential theory to design of linear arrays, **1308**
Tarmakhov, B. D., secondary-emission cathodes of high stability, **2582**
Tchernicheff, A., spectrometer for radiotelegraphy, **3056**
Teal, G. K., M. Sparks and E. Buehler, growth of Ge single crystals containing p-n junctions, **1682**
—— with others, p-n junction, Ge, theory and experiment for, **1669**, transistors, **3177**
Teare, B. R., Jr, making engineering education professional, **(A)2308**
Teasdale, R. D., with R. A. Martin, tuned coupled circuit for oscillator application, **(A)2123**
Tebble, R. S., and W. D. Corner, reversible susceptibility of ferromagnetic materials, **1168**
Teichmann, T., beam oscillations in f.m. cyclotron, **1214**
Teitell, L., with S. Berk, effect of fungus growth on insulating tapes, **3025**
Telesnin, R. V., laws governing magnetic viscosity, **2409**
—— and E. F. Kuritsyna, dependence of magnetic viscosity on temperature, **2410**
—— and S. Z. Ushakov, magnetic viscosity of permalloy, **2734**
Tellegen, B. D. H., forces between two current-carrying conductors, **92**
—— and E. Klauss, parameters of passive gyrator quadripole, **301**; resonant circuits coupled by quadripole, **2945**
Teller, E., with F. de Hoffmann, magneto-hydrodynamic shock waves, **605**
Templin, E. W., with others, professional magnetic-recording system for films, **2629**
Terahata, S., with others, travelling-wave c.r. tube, **503**
Terletski, Ya. P., with P. E. Kolpakov, propagation of e.m. field of sunspots, [illegible]
Terroni, T. B. D., 12-channel carrier telephone system, **2537**
Terry, R. L., and R. B. Watson, reciprocity calibration of microphones using pulse technique, **(A)558**
Tessner, S., modern theories on dielectrics and semiconductors, **375**
Thaler, W. J., with others, high-intensity-spark light source, **1222**
Thénard, J., with G. Valladas, differential method of counting in pulse-amplitude selectors, **577**
Theuerer, H. C., and J. H. Scaff, effect of heat treatment on Ge, **2201**
Thiede, H., magnetostrictive ultrasonic apparatus, **2613**
Thiemann, H., eidophor method for large-screen television projection, **485**
Thien-Chi N'Guyen. See N'Guyen, Thien-Chi.
Thierfelder, C. W., with L. E. Swedlund, projection kinescope 7NP4 for theatre television, **2851**
Thiessen, G., spectral investigations of general magnetic field of sun, **1141**
Thiessen, G. J., resonance characteristics of finite catenoidal horn, **7**
—— with W. G. Schneider, velocity of sound in He, **515**
Thoma, A., with W. Hart, Die Differentialgleichungen der Technik und Physik, **(B)148**
Thomas, A. L., Jr, graph-scope, electronic graph plotter, **1216**
Thomas, A. M., Lichtenberg figures and ionization of dielectric surfaces, **2456**
Thomas, D. G. A., and H. W. Finch, simple electrometer using vibrating-plate capacitor, **159**
Thomas, H., resistance alloys, **2751**; wide-angle deflection yoke design, **(A)2292**
Thomas, H. A., measurement and regulation of magnetic fields by nuclear resonance method, **(A)2226**
Thomas, Horace A., measurements of atmospherics at h.f., **169, 208**
Thomas, L. A., with others, growth of large quartz crystals, **3024**
Thomas, R., with C. Brasse, Jr, horizontal-polarization omnidirectional aerial, **2920**
Thomasson, D. W., electronic colorimetry, **2248**; signal sources for television testing, **1202**
Thompson, L. E., distortion in multichannel f.m. relay systems, **1489**; microwave propagation experiments, **202**
Thompson, P. O., with others, masking of pure tone at gap in thermal-noise spectrum, **(A)544**
Thomson, J., Radio Communication at Ultra-High Frequency, **(B)742**
Thomson, W. E., with W. A. Cawthra, bandwidth of sinusoidal carrier wave, with f.m. by rectangular wave, **1242**
Thomson, W. T., transmission of plane elastic waves through plate, **1046**
Thonemann, P. C., and W. T. Cowhig, self magnetic field in gas discharges, [illegible]
Thouzéry, J., double-T RC filter, **2670**
Thurston, W. R., direct-reading u.h.f. admittance meter, **163**
Tien, Ping King, with others, amplification by acceleration and deceleration of single-velocity beam, **2068**
Tigler, H., high-speed pulse modulators for radar transmitters, **2431**
Tiley, J. W., automatic aerial-polar-diagram recorder, **(A)2100**
Tillman, J. R., transition in Eccles-Jordan circuit, **2119**
—— and H. Yemm, decay of current in Ge diodes, **1528**
—— with J. E. Flood, crosstalk in a.m. time-division multiplex systems, [illegible]
Tilton, E. P., civil-defence portable transmitter-receiver, **3110**
Timbrell, V., absolute measurement of sound pressures at high frequency, **1555**
Tischer, F., inductive probe for microwave measurements, **3048**
Titchmarsh, E. C., eigenfunction problems for case of periodic potentials, **676**
Tizard, R. H., and B. G. V. Harrington, electronic speed control for carriage of ship-model testing tank, **418**
Tobin, M. W., H. Grundfest and R. L. Schoenfeld, instantaneous peak voltometer, **2481**
Todd, A. C., aerial radiation-diagram analyser, **282**
Tolansky, S., and W. Bardsley, interferometric studies of quartz-plate vibration, **1939**
Tolbert, C. W., and A. W. Straiton, phase-shift refractometer, **2472**
—— with A. W. Straiton, factors in v.h.f. wave propagation, **(A)2799**
—— with others, tropospheric scattering of radio waves, **2811**
Tolstoi, N. A., jumps in conductivity of BaTiO$_3$, **2447**
—— and P. P. Feofilov, new method of studying relaxation processes, **1872**
Tombs, D. M., and J. F. Ward, f.m. in capacitance measurement, **396**
Tomiyasu, K., and S. B. Cohn, directional coupler permitting full power transfer, **(A)2100**
Tootill, G. C., with others, small-scale experimental high-speed digital computer, **1952**
Toraldo di Francia, G., critical review of general laws of diffraction, **83**
—— with M. Schaffner, evanescent microwaves generated by diffraction, **1554**
Toulon, P. M. G., 'knight' scanning in television, **243**
Townsend, C. L., and E. D. Goodale, orthogam television amplifier, **759**
Townsend, M. A., cold-cathode counter valves, **783**
Tozzi, R., microwave power measurements, **397**
Tranter, C. J., dual integral equations in potential problems, **1614**
Trautman, D. L., and J. A. Aseltine, amplifier synthesis on equal-ripple basis, **(A)2122**
Trébuchon, G., and J. Kieffer, physics of glass/metal sealing, **135, 929, 2461**
Tremellen, K. W., long-distance propagation in 10–30-kc/s and 0·5–1·1-Mc/s bands, **978**
Trendelenburg, F., with W. Schaaffs, X-ray investigation of sound waves due to dielectric breakdown, **86**
Tricaud, J. B., array theory and nonresonant slotted waveguides, **2641**
Troelstra, S. A., coating by electrophoresis, **3028**
Tronnier, H., and H. Wagener, all-mains amplifier for photocell measurements, **2777**
Tropper, H., Electric Circuit Theory, **(B)320**
Trott, W. J., and C. L. Darner, properties of sound-absorbent panels at high hydrostatic pressures, **(A)545**
Trout, C. C., with others, 100-channel distance-measuring equipment, **2722**
Trouvé, S., with M. Matricon, distribution of space charge in thermionic valves, **1514**
Truxal, J. G., network synthesis applied to feedback control, **(A)2284**
Tucker, D., with others, ultrasonic effects on animal tissues, **1050**
Tucker, D. G., and R. A. Seymour, synchrodyne as precision demodulator, **204**
—— with I. F. Macdiarmid, polyphase modulation for telecommunication filter problems, **213**
—— with R. A. Seymour, choke-coupled phase inverter of high accuracy, **1586**
Tucker, J. D., determinantal solution of phase-shift oscillators, **1597**
Tuller, W. G., information theory and system design, **2274**
Turnock, R. C., with H. A. Prime, iconoscope electro-optical shutter for high-speed photography, **1233**
Twersky, V., nonspecular reflection, of e.m. waves, **2692**, of sound from absorbent surfaces, **(A)1811**, of sound from planes with absorbent bosses, **2316**; scattering of sound waves by spheres and cylinders, **9**
Twiss, R. Q., Bailey's theory of circularly polarized waves in sunspots, **624**
Tyler, V. J., remote-control system for radio transmitters, **2798**
Tyrrell, A. J., performance and stability of permanent magnets, **2213**
Tyrrell, W. A., Laplace Transformation Theory and Engineering Applications, **(B)3039**
Tyson, B. F., u.h.f. converter, **(A)2292**
—— and J. G. Weissman, r.f. amplifier for u.h.f. television band, **(A)2292**
Tyzzer, F. G., with H. C. Hardy, scale-model studies of amphitheatre acoustics, **(A)549**
—— with others, comparison of absorption coefficients, **(A)1811**

U

Uhlenbeck, G. E., with J. L. Lawson, Threshold Signals, Radiation Laboratory Series Vol. 24, **(B)1234**
Uitjens, A. G. W., with others, electrical recording of diagrams with systems of coordinates, **3075**
Ulner, M., German magnetic sound-recording system for films, **2631**
Ulrich, C. W., single-input attenuators with multiple outputs, **1590**
Umpleby, K. F., with E. L. Crosby, Jr, h.f. amplifiers with direct coupling, **(A)2122**
Ungvary, R. I., with others, operation of split-anode magnetron, **1120**
Union Radio Scientifique Internationale, Bruits Radio-Électriques Solaires et Galactiques, **(B)115**
Unsöld, A., cosmic radiation and magnetic fields, **2990**; origin of galactic r.f. radiation and cosmic rays, **1364**
Unthank, H. W., with others, sudden commencements and impulses in geomagnetism, **2708**
Unwin, R. S., with B. Milnes, radio meteorological investigation in New Zealand, **600**
Urban, P., with F. Ledinegg, theory of oscillations in coupled cavity resonators, **1115**
Urtel, R., self-excited generators for deflection currents, **491**
Ushakov, S. Z., with R. V. Telesnin, magnetic viscosity of permalloy, **2734**
Uslan, S. D., with J. F. Rider, Encyclopedia on Cathode-Ray Oscilloscopes and their Uses, **(B)2491**
Uzan, R., with G. Mesnard, treatment of tungsten wire for valves, **1412**

V

Vainshtein, L. A., circular waveguide, open end of, asymmetrical waves from, **2336**, diffraction of waves at, **2337**
Valentine, J. M., with A. L. Cockroft, proportional counters and ion chambers with external graphite electrodes, **709**
Valladas, G., and J. Thénard, differential method of counting in pulse-amplitude selectors, **577**
Vallarino, A. R., and C. Greenwald, low-distortion f.m. modulators, **(A)2298**
Vallée, R., Hilbert space, problem in cybernetics referred to, **2023**, and properties of periodic and pulsed systems, **2534**
Van Bladel, J. See van Bladel, J.
Vance, A. W., simulation of three-axis guided missile system (Typhoon), **(A)2245**
Vancour, R. P., with V. F. Hess, atmospheric ionization, **894**
Van Duyne, J. P., with others, high-stability u.h.f. television tuner, **(A)2292**
Van Dyck, A. F., with others, Television, Vols. 5 & 6, **(B)2038**
Van Dyke, K. S., matrices of piezoelectric, elastic and dielectric constants, **(A)610**
Van Wambeck, S. H., and A. H. Ross, performance of diversity receiving systems, **2268**
—— with J. L. Glaser, experimental evaluation of diversity receiving systems, **2267**
Váradi, P. F., ferromagnetism in metal compounds, **2202**
Varian, S. F., with others, amplifier klystron, K-band, **(A)2304**, for u.h.f. television, **(A)2304**; crystal control of 4-kW 1036-Mc/s transmitter, **(A)2298**
Vastel, J., modern low-power h.v. generators, **2506**
—— with P. Grivet, preliminary measurements on linear electron accelerator, **1738**
Vecchiacchi, F., long-distance television links, **238**
Vedder, E. H., improving industrial control design, **2781**
Vegard, L., auroral spectra and physics of ionosphere, **1151**
Veith, W., photoelectric properties and emission mechanism of Cs/Sb films, **643**; signal formation in conductron pickup tubes, **1496**
Veldkamp, J., propagation of sound over great distances, **1542**
—— with J. Bartels, international data on magnetic disturbances, third quarter 1949, **1370,** first quarter 1950, **630,** second quarter 1950, **870,** third quarter 1950, **1894,** fourth quarter 1950, **2705**
Velichkina, T. S., and I. L. Fabelinski, velocity of ultrasonic waves in fluids, **2084**
Vellat, T., radiation of dipole inside rectangular waveguide, **816**
Vepa, R. K., variation of resistance in resonator neck, **2321**
Vérain, L., and P. Jolivet, underwater gaussmeter, **158**
Verhoeff, A., with others, Philips 100-kV electron microscope, **1458**
Verma, G. S., effects of humidity on ultrasonic absorption in air at 1·46 Mc/s, **1049**
Vermeulen, R., and W. K. Westmijze, expressor system for transmission of music, **17**
Vernotte, P., smoothing of experimental curves, **2753**
Ver Planck, D. W., L. A. Finzi and D. C. Beaumariage, analysis of feedback magnetic amplifiers, **47**
Verse, H., calculation of rectifiers with buffer capacitors, **994**
Vervest, W. L., with A. G. Robeer, automatic electrical tuning of large transmitters, **765**
Verwey, E. J. W., and others, controlled-valency semiconductors, **905**
Veverka, A., with others, natural frequencies of single-layer solenoids subjected to voltage surges, **1099**
Vieille, E., with M. Schérer, propagation of discharge in G-M counters with external cathode, **710**
Vigean, F., quenching action of long-wave radiation in electrophotoluminescence, **1607**
—— and D. Curie, quenching action of long-wave radiation in electrophotoluminescence, **1608**
Vigneron, H., m-λ propagation measurements in aircraft, **199**
Vigoureux, P., Ultrasonics, **(B)2096**
—— and C. F. Booth, Quartz Vibrators and their Applications, **(B)2464**
Vilbig, F., frequency compression and expansion for speech sounds and reproduction from visible-speech records, **1057**
Villard, O. G., Jr, RC amplifier with independent control of selectivity and bandwidth, **2395**
Ville, J., decomposition of signal into cos^2 components, **2933**; functional equation of information theory, **2828**
Vinal, G. W., Primary Batteries, **(B)748**
Violet, P. G., fundamentals and applications of colour-trace tubes, **1031**
Visvanathan, S., effect of variable mass of electron on diode current, **2585**
Vitkevich, V. V., synchronization of relaxation oscillations, **2656**
Voelkel, H., with E. Menzer, l.f. technique in u.s.w. broadcasting, **453**
Voelz, K., damping of acoustic resonators, **2087**
Voge, J., with others, equipment for study of cm-wave propagation, **3115**
Vogel, T., oscillations in acoustic resonators with elastic walls, **800, 1293**; topological methods for investigating nonlinear oscillations, **1851**
Vogelman, J. H., precision millidecibel waveguide-attenuation measurements, **(A)1958**
Vogt, E., with W. Braunewell, reversal of sign of magnetostriction by expansion, **916**
Vogt, G., commercial u.s.w. receivers, **2821**
—— with others, development of commercial receivers, **2529**; directive aerials for s.w. angle-of-incidence measurements, **434**
Volkers, W. K., direct-coupled amplifier 'starvation' circuits, **1868**; low-level r.f. energy measurements, **(A)2226**
Volkov, D. I., magnetostriction hysteresis of high-coercivity alloys, **1936**
Vonsovski, S. V., and A. V. Sokolov, surface photoelectric effect in ferromagnetics, **2401**
de Voogt, A. H., round-the-world radio signals, **726**
Vormer, J. J., quartz crystals free from harmonics, **1169**
de Vries, F. W., with J. Haantjes, flicker in television pictures, **1503**

W

Wade, F., electrical methods of high-vacuum measurement, **1920**
Wadley, T. L., single-band 0–20-Mc/s ionosphere recorder, **(D)1192**
van der Waerden, B. L., method of saddle points, **2466**
Wagener, H., with H. Tronnier, all-mains amplifier for photocell measurements, **2777**
Wagener, S., efficiency of getters at low pressures, **122, 3012**
—— with G. Herrmann, Die Oxydkathode, 2. Teil, Technik und Physik, **(B)2603**
Wagner, H. M., valve-characteristic tracer using pulse techniques, **2488**
Wagner, K. W., Operatorenrechnung und Laplacesche Transformation, **(B)147**
Wagner, S. J., Jr, 92.9 Mc/s propagation over 127 miles, **(A)2799**
Wagner, T. C. G., design of triple-tuned and quadruple-tuned circuits, **2132**
Waidelich, D. L., pulse-reception filters, **(A)2122**
Wait, G. R., with O. H. Gish, thunderstorms and earth's general electri-

fication, [illegible]
Wald, S., magnetic-powder clutch, **456**
de Walden, S., frequency selectivity of ear, **(D)2617**
—— and J. C. Swallow, aural-null and twin-channel c.r. direction finders, **(D)118**
Waldmeier, M., provisional sunspot numbers, Oct.–Dec. 1949, **1361**, April–June 1950, **628**, July–Sept. 1950, **864**, Oct.–Dec. 1950, **1887**, Jan.–March 1951, **2702**; radio-helioscopy, **2422**
Waldo, G. V., with J. S. Hill, v.h.f. tropospheric measurements, **(A)2799**
Waldorf, S. K., with others, ultrasonic measurement of water velocity, **416**
Walker, A. C., growing piezoelectric crystals, **920**
Walker, E. A., A. H. Waynick and P. G. Sulzer, polar vector indicator, **166**
Walker, F. J., with H. W. Kretsch, speed-controlled switch, **2936**
Walker, G. B., congruent space-charge flow, **1275**; e.s. field, in multigrid radio valve, **1279**, in planar triode, **1277**
Walker, H. P., with others, effects of contaminants on electrical insulation, **130**
Walker, J. P., and C. H. Allen, sonic wind and static pressure in intense sound field, **(A)518**
Walker, P. H., electronic measurement of yarn irregularities, **419**
Walker, R. C., The Industrial Applications of Gasfilled Triodes (Thyratrons), **(B)2306**; Photoelectric Cells in Industry, **(B)792**
Walkinshaw, W., with D. W. Fry, linear particle accelerators, **180**
Wallace, R. L., Jr, duality and transistor-circuit design, **2662**
—— and W. J. Pietenpol, circuit properties of *n-p-n* transistors, **2957**
—— and G. Raisbeck, duality and transistor-circuit design, **2369**
Waller, W. E., wide-band bolometer development, **(A)1958**
Walsh, J. E., spherical reflector research at A.F.C.R.L., **(A)2642**
Wang, An, magnetic delay-line storage, **2339**
Ward, E. E., impedance and Laplace transform, **2926**
Ward, H. M., emergency power supplies for microwave relay systems, **234**
Ward, J. F., with D. M. Tombs, f.m. in capacitance measurement, **396**
Ward, W. H., M. H. Oliver and S. J. Fray, h.f. resistance-standards for calibration of admittance bridge up to 60 Mc/s, **691**
Ware, A. A., high-current toroidal ring discharge, **2147**
Warenghem, C., quartz in radio equipment, **1938**
Warminsky, R., with I. Broser, dependence of electrical properties of CdS on electrode arrangement, **1929**
Warnecke, R., and O. Doehler, travelling-wave valve with transverse electric and magnetic fields, **1276**
—— O. Doehler and D. Bobot, space-charge effects in travelling-wave valves with magnetic field, **1022**
—— O. Doehler and P. Guénard, delay lines of comb or interdigital type, **772**
—— O. Doehler and W. Kleen, electron beams and e.m. waves, **3166**
Warner, A. W., h.f. crystal units for primary frequency standards, **(A)1958**
Warner, J., application of radar to geodetic surveying, **1154**
Warren, C. E., with H. S. Kirschbaum, design of pulse transformers, **828**
Washington, G., Jr, electronic production of half-tone blocks, **2261**
Wasow, W., random walks and eigenvalues of elliptic difference equations, **1416**
Wasserrab, T., theory of double layers in low-pressure discharges, **1345**
Waterman, A. T., Jr, with others, ionospheric radio-wave polarization, **1464**
Waters, W. E., Jr, with others, back heating of magnetron cathodes, **789**
Wathen-Dunn, W., with S. R. Bradshaw, square-wave testing of disk recording systems, **(A)551**
—— with others, American Standard Z24.9–1949, coupler calibration of earphones, **21**
Watkins, D. A., with others, amplification by acceleration and deceleration of single-velocity beam, **2068**
Watkins, H. C., recent advances in solders and soldering, **1172**
Watkinson, E., universal coil winding, **1854**
Watson, H. H. H., with others, design and operation of 30-MeV synchrotron, **1213**
Watson, R. B., directional patterns of polystyrene rod aerials, **1570**
—— with M. G. Cheney, Jr, diffraction of e.m. waves by two parallel half-planes, **2414**
—— with R. L. Terry, reciprocity calibration of microphones using pulse technique, **(A)553**
Watt-Carter, D. E., with F. G. Balcombe, Burnham radio station, **452**
Watts, C. E., thorn needles, **(D)1831**
Wax, N., amplitude limits for certain relaxation oscillations, **1852**
—— with A. H. Taub, theory of planar diode, **777**, **(C)1800**
Waymouth, J. F., Jr, deterioration of oxide-coated cathodes operated at low duty-factor, **1526**
Waynick, A. H., with others, polar vector indicator, **166**
Weaver, W., with C. E. Shannon, The Mathematical Theory of Communication, **(B)455**
Weber, A. M., and E. B. Roberts, 1950 world isogonic chart, **1893**
Weber, E., Electromagnetic Fields, Theory and Application, Vol. 1, Mapping of Fields, **(B)859**
Weber, H., theory of method for determining a.c. resistivity of ground, **1193**
Weber, J., distributed amplification, **(A)2122**; microwave methods in gas analysis, **(A)2158**
Weber, K. H. R., analysis of spectrum of very low frequencies by magnetic equipment, **1720**; modulation measurement at frequency-dependent maximum-amplitude points, **1826**
Webster, F. A., nfluence of interaural phase on masked thresholds, **2619**
Webster, F. V., and K. S. Driver, h.f. permeability of ferromagnetic materials, **1167**
—— with R. Millership, h.f. permeability of ferromagnetic materials, **913**
Webster, J. C., with others, masking of pure tone at gap in thermal-noise spectrum, **(A)544**
Webster, W. M., with E. O. Johnson, plasmatron continuously controllable gas tube, **(A)2304**
—— with L. Malter, determination of gas-discharge constants from probe data, **2972**
Wechsung, H., works instruments for h.f. current measurement, **3044**
Weekes, K., with others, ionospheric propagation of low- and very-low-frequency waves, **2522**
Weeks, J. R., metallized-paper capacitors, **53**
Weeks, P. T., reliability in miniature valves, **2573**
van Weel, A., bandwidths of resonant lines and lumped LC circuits, **1107**
Wegmann, L., electron microscope, determination of resolving power of by Fresnel diffraction, **706**, representation of atomic distances by, **2501**
Wehner, G., electron plasma oscillations, **2875**
Weil, L., coercive field, of Fe/Ni powders, **3017**, of granular and aggregated ferromagnetic materials, **654**
—— and L. Bóchirol, measurement of Young's modulus of ferrites, **2737**
Weiland, C. F. van L., bandspreading and scale equalization for RC tuning networks, **1125**
Weill, J., with others, logarithmic amplification of weak currents using diodes, **2228**
Weinitschke, W., measurement of reactance by double potential divider, **3042**
Weinreich, O. A., emissivity changes of thoria cathodes, **1523**
Weinstein, M. S., and W. C. Wineland, transmission and reflection of ultrasonic waves by metal plate in water, **(A)524**
Weis, A., magnetic variometer, **1870**
Weissler, A., and V. A. Del Grosso, velocity of sound in sea water, **(A)514**, **1814**
Weissler, P. G., with R. K. Cook, piezoelectric constants of α- and β-quartz at various temperatures, **650**
Weissman, J. G., with B. F. Tyson, r.f. amplifier for u.h.f. television, **(A)2292**
Weitbrecht, W., nonlinear distortion and perception of mistuning of musical intervals, **269**
Welch, H. W., Jr, effects of space charge on frequency characteristics of magnetrons, **1282**
—— and W. G. Dow, synchronous conditions in cylindrical magnetron space charge, **2601**
—— with others, single-cavity resonator for multi-anode magnetron, **(A)2304**
Welker, H., crystal detectors and use at u.h.f., **775**
Weller, B. F., Radio Technology, **(B)2078**
Wellinger, R. P., with W. A. Christoffers, properties of interfaces in metal/ceramic seals, **(A)2194**
Wells, C. P., with R. D. Spence, vector wave functions, **3035**
Wells, H. W., fluctuations in F_2 region between stations 100–150 miles apart, **(A)2799**
Welsby, V. G., The Theory and Design of Inductance Coils, **(B)603**
Wendt, K. R., with W. K. Squires, synchroflection deflection system, **(A)[illegible]**
Wennerberg, G., magnetic modulator for converting d.c. signals, **2114**
Went, J. J., and H. P. J. Wijn, magnetization process in ferrites, **2205**
Werner, K. H., crackle eliminator using Se rectifiers as limiters, **838**
Werner, P. H., tests on magnetic tapes, **557**
Werner, W., television laboratory equipment, **153**
Wertz, F. D., with T. F. Johnston, cylindrical BaTiO$_3$ transducers, **(A)559**
West, A. G. D., large-screen television projection, **486**
West, J. C., with F. C. Williams, position synchronization of rotating drum, [illegible]
West, R., with others, electron voltaic effect, **2303**
West, R. L., and S. Kelly, pickup-amplifier input circuits, **594**
Westendorf, K. B., with F. Lappe, resistor for h.f. measurements, **2759**
Westervelt, P., nonlinear interaction of plane progressive wave with small sphere, **(A)1811**
Westfold, K. C., interpretation of magneto-ionic theory, **1622**; refractive index and classical radiative processes in ionized gas, **334**
—— with J. G. Bolton, galactic r.f. radiation, **866**, at 100-Mc/s, **348**
—— with J. C. Jaeger, equivalent path and absorption for e.m. radiation in solar corona, **1628**
—— with S. F. Smerd, r.f. radiation in ionized gas, and solar radiation, **95**
Westmijze, W. K., with R. Vermeulen, expressor system for transmission of music, **17**
Weston, G. F., thermal conductivity of (Ba,Sr)O, **917**
—— with S. L. Martin, spectral emittance of uncoated and oxide-coated Ni cathodes, **1026**
Westwood, S. A., tape relay, **3107**
Wever, E. G., Theory of Hearing, **(B)1298**
Weygandt, C. N., with others, special devices for differential analysers, **(A)1183**
Whale, H. A., determination of electron densities in ionosphere, **2177**; fine structure of E layer, **2178**
—— and J. P. Stanley, group and phase velocities on magneto-ionic theory, **972**
Whalley, W. B., optimum use of television c.r. tubes, **1502**; simplification of television receivers, **1267**
—— C. Masucci and N. P. Salz, Ge diode as video detector, **2589**
Wheeler, H. A., inductance chart for solenoid coils, **1098**; reactance chart, **1084**; transmission-line impedance curves, **1071**
Whinnery, J. R., effect of input configuration on aerial impedance, **576**
—— with T. T. Taylor, applications of potential theory to design of linear arrays, **1308**
Whitaker, P. D., with R. Street, power measurement for 3-cm and 10-cm waves, **168**
White, E. L. C., and M. G. Harker, equipment for use with C.P.S. emitron, **755**
—— and J. D. McGee, television camera tubes, **(D)2556**
White, G. E. B., developments in metal rectifiers, **3119**
White, G. R., and R. F. Potter, prediction of ionospheric data for antipodal stations, **880**
White, J. E., measurement of sound-source impedance and gas-column attenuation, **13**
White, R. A., with F. N. Gillette, video recording camera, **3135**
White, R. E., with N. L. Davis, fast sweep circuit, **404**
White, R. W., with J. H. H. Merriman, application of f.m. to v.h.f. multi-channel R/T, **(D)1241**
White, S. J., explosion-proof loudspeaker, **2899**
White, W. C., microwaves performing control functions, **1980**
White, W. D., circular polarization as means of reducing radar precipitation return, **(A)2186**; nonlinear sampling filters, **(A)2122**
Whitehead, E. A. N., theory of parallel-plate media for microwave lenses, **1571**; thermal fluctuations of charge in linear circuits, **2396**
Whitehead, J. B., and W. Rueggeberg, h.f. dielectric-loss measurement with changing temperature, **151**
Whitehead, J. R., Super-regenerative Receivers, **(B)735**
Whitehead, M., Ta electrolytic capacitors, **296**
Whiteman, R. A., work coils for induction heating, **958**
Wick, R. F., with W. P. Mason, high-power ultrasonic BaTiO$_3$ transducers, **(A)[illegible]**, **1818**
Widell, E. G., and R. A. Hellar, effect of coating composition on emission of oxide-coated cathodes, **1025**
Widerquist, V. R., and J. E. Boyd, low-level atmospheric conditions and overwater microwave interference patterns, **(A)2799**
Wiegand, C., distributed coincidence circuit, **1599**
Wieland, J., with others, electrical properties of grey tin, **2438**
Wiener, F. M., relation between sound fields radiated and diffracted by plane obstacles, **(A)1811**
—— with others, American Standard Z24.4–1949, pressure calibration of laboratory-standard microphones, **19**
Wiener, W., with others, 32-channel high-speed commutator, **295**
Wiesner, J. B., with Y. W. Lee, correlation analysis, application to communication problems, **(A)679**
—— with others, application of correlation analysis to reception of periodic signals in noise, **730**
Wigge, H., free oscillations of dielectric rings, **1353**
Wiggins, A. M., with W. A. Beaverson, second-order differential microphone with single diaphragm, **20**
van Wijk, A. M., and J. A. N. Burger, secular variation of magnetic elements in South Africa, 1939–1948, **1373**
van Wijlen, H. B., radiographic examination of valves, **2508**
Wijn, H. P. J., with J. J. Went, magnetization process in ferrites, **2205**
Wilbur, D. A., with J. D. Cobine, electronic torch and related h.f. phenomena, **2785**
Wild, J. P., spectrum of high-intensity m-λ solar radiation, **1630**, **2169**, **2170**
—— and L. L. McCready, spectrum of high-intensity m-λ solar radiation, **1629**
Wilde, H., wide-band h.f. low-power transformers with laminated cores, **1578**
Wilder, M. P., with others, getter materials for valves, **499**
Wilkins, A. F., and C. M. Minnis, comparison of ionospheric transmission forecasts with practical results, **2520**
Wilkins, G. A., with A. T. Price, daily magnetic variations in equatorial regions, **2707**
Wilkins, J. J., with others, design of electron synchrotrons, **1212**
Wilkinson, D. H., Ionization Chambers and Counters, **(B)1224**; 99-channel pulse-amplitude analyser for slow counting, **1085**
Willard, G. W., measuring ultrasonic velocity in solids, **(A)516**, **1545**
Willey, H. F., 'sferics' operations in Caribbean area, **114**
Willheim, R., multi-winding transformers, **2930**
—— and F. E. Butcher, magnetic-amplifier technique, **(A)2122**
Williams, A. J., Jr, W. G. Amey and W. McAdam, stabilized wide-band d.c. amplifier, **849**
Williams, A. O., Jr, piston source at high frequencies, **1546**
—— and W. Keck, effects of reflected signals and electric pickup in ultrasonic microphone, **1824**
—— with A. H. Carter, expansion for velocity potential of piston sources, **(A)521**, **1815**
—— with J. D. Nixon, surface vibration patterns of piezoelectric radiators, **(A)558**
—— with others, underwater sound field of quartz transducers, **1821**
Williams, C., l.f. ionospheric radio-wave propagation, and long-distance aerial navigation, **1761**
Williams, E. C., with others, 100-channel distance-measuring equipment, **2722**
Williams, E. M., and E. R. Schatz, design of exponential-line pulse transformers, **1301**
—— D. F. Aldrich and J. B. Woodford, speed of electronic switching circuits, **(C)294**
—— C. H. Grace and L. W. Johnson, timing unit and pulse deflector generator for synchrocyclotron, **(A)2945**
—— with E. R. Schatz, pulse transients in exponential transmission lines, **290**, **1069**
—— with J. B. Woodford, Jr, switching-time limitations in hydrogen thyratrons, **(A)2304**
Williams, F. C., and T. Kilburn, storage system for binary-digital computers, **(D)680**
—— and S. W. Noble, application of magnetic modulators in amplification of small d.c. signals, **152**, **(A)682**
—— and J. C. West, position synchronization of rotating drum, **2020**
—— T. Kilburn and G. C. Tootill, small-scale experimental high-speed digital computers, **1952**
Williams, F. E., with P. D. Johnson, luminescence efficiency of organic solutions and crystals, **1396**
—— with S. Roberts, theory of luminescence of sulphide phosphors, **646**
Williams, H. J., ferromagnetic domains, **326**
—— W. Shockley and C. Kittel, velocity of propagation of ferromagnetic domain boundary, **855**
Williams, H. P., Antenna Theory and Design, **(B)1081**; subterranean communication by electric waves, **2275**
Williams, P. B., with D. J. Plach, 3-unit high-fidelity loudspeaker, **276**
Williams, T., and R. H. Eastop, measurement of harmonic distortion in iron-ore transformers, **2232**
Williams, W. E. with M. L. Greenough, circuit for measuring displacement of pressure-sensitive diaphragms, **1439**
Willmore, A. P., cathode follower as voltage regulator, **231**
Wilman, C. V., with K. H. Dixey, increasing power rating of vibratory converters, **1783**
Wilmotte, R. M., interference caused by several signals, **443**; polycasting, **3128**
Wilson, J. M., electronic control of home heating, **1205**
Wilson, R. F., with J. E. Jacobs, X-ray liquid level gauge, **(A)2245**
Wilts, C. H., with others, nonlinear devices in analogue computers, **143**
Winans, R. R., with others, aging of plastics under various climatological conditions, **2453**
Windle, J. J., with T. M. Shaw, microwave measurement of permittivity of fibres, **686**
Wineland, W. C., with M. S. Weinstein, transmission and reflection of ultrasonic waves by metal plate in water, **(A)524**
Winter, P. H., with R. L. Sanford, permeameter for magnetizing forces up to 300 oersted, **157**
Wintle, M. F., precision calibrator for l.f. phase meters, **2770**
Wintringham, W. T., tone rendering in photography, **758**
Wisnyi, L. G., with others, high-temperature vacuum induction furnace, **3078**
Wissolik, R. A., with D. P. Heacock, low-noise miniature pentode, **2063**
Wittenberg, H. H., pulse method of measuring deionization time, **781**
von Wittern, W. W., with H. E. von Gierke, condenser microphone sensitivity measurement, **2624**
Wittich, P., leakage distribution in transformers with more than two windings, **2928**
Witty, R., characteristics of diffusion pumps, **121**
Wlerick, G., rectification in asymmetrically illuminated semiconductors, **3013**
Wohlfarth, E. P., energy bands in collective electron ferromagnetism, **2154**
Wolf, I., spectral sensitivity of Se photocells, **3158**
Wolman, W., attenuation equalization in pass band of ladder filters, **1111**
Wong, Ming S., with others, precision coaxial resonant line for impedance measurements, **(A)1958**
Wood, A. B., Physical Society's Exhibition, 1951, **2236**
Wood, W. S., apparatus for accurate frequency measurement, **1722**
Woodford, J. B., Jr, and E. M. Williams, switching-time limitations in hydrogen thyratrons, **(A)2304**
—— with others, speed of electronic switching circuits, **(C)294**
Woodward, A. M., with G. G. Macfarlane, small-signal theory of wave propagation in uniform electron beam, **261**
Woodward, J. G., feedback-controlled calibrator for pickups, **(A)1811**
Woodward, P. M., and I. L. Davies, theory of radar information, **895**
Woolley, R. v. d. R., and C. W. Allen, ultraviolet emission from chromosphere, **1632**
Woonton, G. A., and others, diffraction errors in optical investigation of aerial pattern, **2110**
Wooster, N., with others, growth of large quartz crystals, **3094**
Wooster, W. A., with others, growth of large quartz crystals, **3094**
Wrathall, E. T., and C. P. Beanland, s.s.b. system of h.f. radio transmission, [illegible]
Wren, T. C., with others, power-line carrier system for multistation control, telemetry and communication, **425**
Wright, D. A., Semi-Conductors, **(B)2420**
Wright, R. W., electrical properties of CdO, **2200**
—— with others, dispersion mechanisms in ferrites, **337**
Wu, H. S., with others, beam analyser, **(A)2226**
Wulf, O. R., and M. W. Hodge, relation between geomagnetic field and circulation of atmosphere, **1369**
Wulff, V. J., with W. J. Fry, ultrasonic irradiation of nerve tissue, **(A)528**
—— with others, ultrasonic effects on animal tissues, **1060**
Wulfsberg, K. N., with others, five-digit parallel coder tube, **(A)2220**
Wüster, H. O., with K. Försterling, origin of harmonics in ionosphere, **721**; reflection in inhomogeneous medium, **2187**
van der Wyck, C. T. F., cylindrically diverging e.m. waves in nonuniform medium, **32**
Wylie, F. J., port approach and berthing in fog, **2719**
Wyman, J. H., sequence timer for moulding press, **955**

Y

Yabsley, D. E., atmospheric noise levels near Darwin, **1764**
—— with F. J. Lehany, solar radiation at 1200, 600 and 200 Mc/s, **(C)861**
—— with others, radio observations of two large solar disturbances, **2168**; solar radiation at 50 cm during eclipse, **346**
Yachter, M., with others, inaccuracies in feedback control systems, **223**
Yager, W. A., F. R. Merritt and C. Guillaud, ferromagnetic resonance in ferrites, **1674**
Yamakawa, K. A., AgBr crystal counters, **2511**
Yeh, Chai, and E. L. Chaffee, h.f. impedance of low-pressure gaseous diodes, **778**
Yemm, H., with J. R. Tillman, decay of current in Ge diodes, **1528**
Yeo, D., with J. T. Kendall, magnetic susceptibility and anisotropy of mica, **1687**
Yorke, R., and K. R. McLachlan, amplifier of variable output impedance, **2681**
Yost, D. M., with W. V. Goeddel, ferromagnetism in Mn-In system, **2442**
Young, C. W., proposed numbered frequency-band subdivision plan, **2269**
Young, D. R., temporary enhancement of hysteresis in BaTiO$_3$, **(D)2207**
Young, J., with others, sound transmission through single and double walls, **(A)1811**
Young, J. Z., and F. Roberts, flying-spot microscope, **1733**
Young, M., with J. Ruze, measurement of reflection coefficient of metal-plate structures, **1880**
Young, R. S., with H. R. Clayton, ultrasonic lamination flaw detection equipment, **3072**
Young, R. T., Jr, L. W. Holmboe and W. E. Waters, Jr, back heating of magnetron cathodes, **789**
Youtz, P., with others, e.s. storage tube, **1034**
Yu, Y. P., measuring vector relationships, **3058**
—— H. E. Kallmann and P. S. Christaldi, millimicrosecond oscillography, [illegible]
Yustein, S. E., R. R. Winans and H. J. Stark, aging of plastics under various climatological conditions, **2453**

Z

Zablocki, H. S., with L. A. Rosenthal, electronic differential a.c. voltmeter, **689**
Zadeh, L. A., correlation functions of phase and delay-modulated signals, **2536**; linear varying-parameter networks, analysis of, **834**, band-pass low-pass transformation in, **591**, constant-resistance, **(A)2122**, **2667**, correlation functions and power spectra in, **586**, initial conditions in, **2668**, stability of, **2124**
Zakheim, J., oscillator frequency stabilization, **1118**
Zappacosta, A. D., with others, design of mobile equipment for 152-174 Mc/s, **989**, **1782**
Zarem, A. M., F. R. Marshall and F. L. Poole, Kerr-cell photographic shutter, **235**
Zanderer, J., with others, inaccuracies in feedback control systems, **223**
Zeluff, V., and J. Markus, Electronics Manual for Radio Engineers, **(B)1750**
Zener, C., interaction between *d*-shells in transition metals, **2441**
Zenner, R. E., magnetic recording with a.c. bias, **1837**
Zepler, E. E., valve input conductance at v.h.f., **1804**
—— and S. S. Srivastava, interelectrode impedance in triodes and pentodes, **2590**
Zetrouer, W. F., II, with W. J. Kessler, l.f. ionosphere soundings by observation of atmospherics, **(A)2263**
Zhelestsov, N. A., theory of symmetrical multivibrator, **2867**
Ziegler, H., with E. Stiefel, natural eigenvalue problems, **1176**
van der Ziel, A., induced grid noise in triodes, **2878**
Zijlstra, P., with E. G. Dorgelo, two transmitting valves for mobile

- installations, 2062
- **Ziniuk, M. A.**, four-gun oscilloscope, (A)2226
- **Zinke, O.**, wide-band aerials, for decametre and metre waves, 571, for m and dm waves, 572, and resonant compensation circuits, 1310
- **Zisler, S.**, impedance characteristics of thick cylinders, 2645
- —— with J. L. Steinberg, detection of solar r.f. radiation reflected by moon, 626
- —— with others, correlation of geomagnetic and solar activity, 2983
- **Zoner, H.**, with others, electrical properties of grey tin, 2438
- **Zollers, S. M.**, with J. H. Reisner, permanent-magnet electron microscope, 1457
- **Zucker, F. J.**, behaviour of microwaves in focal regions, (A)2100
- **Zuidhof, R.**, Wien-bridge network modifications, 403
- **Zunick, M. J.** and J. B. Gosling, glass selection and production techniques for X-ray and other tubes, 2314
- **Zurmühl, R.**, Matrizen, (B)1955
- **Zwikker, C.**, absorption of sound by porous materials, 272
- **Zwislocki, J.**, acoustic filters as ear protectors, 1553; theory of action of cochlea, 1052
- **Zworykin, V. K.**, television, electronics in, 253, camera tubes and applications, 483, industrial, 1505

* * *

SUBJECT INDEX

SYMBOLS (A) Abstract, (B) Book Review, (C) Note of Correction, (D) Discussion

A

- **Abacs,** (See also Charts; Nomogram)
  - for calculation of field strength of u.h.f. aerial systems, 2814
  - and graphs, for distortion in i.f. amplifiers, 1122
  - for minimum-loss matching pads, 1587
  - for mismatch error in series-connected attenuators, 317
- **Absorption,** (See also Acoustics; Ionosphere)
  - acoustic, comparison of measured and calculated coefficients, (A)1811
    - in fluids, mechanisms of, (A)529
    - in fog, 2614
    - long-tube method for field measurements of, (A)548
    - of materials at high hydrostatic pressures, (A)545
    - of porous materials, 272, (A)1811
  - atmospheric, microwave, Van Vleck-Weisskopf equation, (A)2685
  - ionospheric, and forecasting, 728
    - and Lorentz polarization term, 2428
    - at 150 kc/s, (A)2712, vertical-incidence, 1901
  - microwave, of gases, applied to analysis of gas mixtures, (A)2158
    - and molecular structure, 619
  - u.h.f., in organic liquids, 1356
    - in substituted benzene compounds, 2162
  - ultrasonic, in air, effect of humidity on, 1049
    - and dispersion, in water, 1548
    - in liquids, (A)531, 1550
    - in $MgSO_4$ solutions, (A)530, 1549
- **Acoustics,** (See also Absorption; Impedance; Sound; Ultrasonics)
  - of amphitheatres, study with small-scale models, (A)549
  - of auditoria, criterion for short-period transient response, (A)546
  - bibliography, 1, 1042, 1541, 1812, 2309, 2608
  - of concert hall, South Bank, London, 802
  - of coupled rooms, 15
  - design of sound-absorbing ducts, (A)1811
  - equipment for field measurement of reverberation times, (A)1811
  - of halls, new theories of, 803
  - masking of pure tone at gap in thermal-noise spectrum, (A)544
  - multiple-echo effect due to release of stored wave-train, 1819
  - radiation pressure in, 2888
  - of rooms, automatic measurement of reverberation time, 1830
    - record-rerecord test of, (A)1811
    - reverberation time and sound power requirements, 14
  - source impedance and gas-column attenuation measurement, 13
  - standard pitch for B.B.C., 1820
  - of studios, for broadcasting, 1833
    - and of microphones, relation between, 801
  - threshold and loudness of repeated bursts of noise, (A)543
  - viscosity effects in acoustic inductances, (A)1811
  - wide-range acoustic termination, (A)1811
- **Admittance** meter, u.h.f., direct-reading, 163
- **Adsorption,** of O_2 on W, 1937
- **Aerial arrays,** broadside, reduction of side-lobe radiation of, (A)2100
  - with circular symmetry, optimum current distributions for, (A)2100
  - collinear, theory of, 1073
  - directive, with cylindrical reflector, (A)2100
    - two-tower, radiation-pattern calculator for, 2350
  - folded-dipole, Andrew Type-3000, for 148–174 Mc/s, 823
  - linear, potential theory in design of, 1308
  - loop, stagger-tuned, for l.f. loran, (A)2100
  - microwave, s.w.r. of, approximate method for, 822
  - slotted-waveguide, radiation from, (A)2642
  - television, on Empire State Building, New York, 1261, 1568
    - u.h.f., Bridgeport, design of, 284
  - wide-band, feeders for, (A)2642
- **—— systems,** coupled, complex radiation resistance of, 1846
  - for direction finding, (A)2642
  - microwave, Schmidt-type, (A)2100
  - for multichannel mobile R/T, 569
  - radar, for uniform irradiation of a surface, 117
  - wide-band, for circular polarization, 2353
  - Wrotham, horizontal-polarization slot radiator, 2340, transmission line and a.m./f.m. combining filter for, 2643
- **Aerials,** (See also Lenses, microwave; Radiation; Radiators; Transmission lines)
  - aircraft, omnidirectional, for v.h.f. and u.h.f., 2651
    - small, l.f., characteristics of, (A)2642
  - beam, and large surfaces, power radiated by, formulae for, 40
  - broadcasting, anti-fading, 2644
    - m.f., calculation of, 2916
    - simultaneous feeding by two transmitters, cross-modulation with, 1507
    - simultaneous feeding from 100-kW and 20-kW transmitters at Toulouse-Muret, 1506
  - circularly grouped, as omnidirectional and unidirectional radiators, 568
  - concentric-slot, theory of, (A)2100
  - in conducting media, analysis for, (A)2642
  - conical, wide-angle, with coaxial-line feed, radiation from, 1307
  - current distribution in, integrals in calculation of, 2917
  - cylindrical, asymmetrically driven, and sleeve dipole, 286
    - with axial slits, theory of, 821
    - thick, impedance characteristics of, 2645
  - delta, multiple-wire, 600 Ω, effect of mast and guy wires on, 1567
  - dielectric rod, polystyrene, radiation patterns of, 1570
    - radiation patterns for TM_{01} mode, 1075
    - with shaped radiation patterns, 2921
  - dielectric-rod and dielectric-tube, directive, 287
  - dielectric-tube, radiation characteristics of, 38
  - diffraction, circular, theory of, 1305
  - dipole, near conducting cylinders, theory of, 1306
    - horizontal, low, input impedance of, (D)35
  - dipole and loop, located near elliptical cylinders, patterns of, 2649
  - directive, aperiodic, for ionospheric recorders, 2646
    - receiving, response to scattered radiation, 2654, for s.w. angle-of-incidence measurements, 434
    - transmitting, 2-element, design and performance of, 2653, for λ 3 cm–3 m, for beam stations, 2352
  - for elliptical polarization, analysis of transmission between, 2346
    - complex-vector analysis for, 2419
    - measurements on, 2349
  - fan-beam, 3-cm λ, radiation pattern measurements on, site errors in, 1077
  - feeder connections, balance-to-unbalance transformer for, 825
  - feeders for, coaxial-type, 288
    - long, distortion of f.m. signals by, 43
    - phase distortion in, 1067
  - folded-dipole, impedance transformation in, 34
  - helical, circular and square, field calculations for, 1844
    - current distributions on, 2647
    - maximum directivity of, 2342
    - stranded-wire, receiving, design of, 1573
  - horn, biconical, (C)2345
    - e.m., gain of, 1847
    - rectangular, radiation field for H-mode waves in, 1843
  - ice formation on, 818
  - impedance of, analysis of, (A)2648
    - effect of input configuration on, 576
  - microwave, 824
    - phase-front plotter for, 2486
    - reflectors for, doubly-curved, design of, (A)2642, simulating infinite conducting plane, (A)1958, 2354, spherical, work at A.F.C.R.L., (A)2642
  - omnidirectional, horizontal-polarization, for 10-cm band, 2920
  - parabolic-cylinder, 1572
  - paraboloidal, 820
    - elliptical-aperture, pattern calculations for, 39
  - parallel, mutual impedance of, (D)1309
  - polar diagrams of, computer for, 282
    - model technique for, 575
    - recorder for, 1705, (A)2100
  - progressive-phase, producing specified beam shape, (A)2100, (A)2642
  - radar, cheese, for marine navigation, 1080
    - microwave, 1850
  - radiation from, effect of circular ground-plane on, 567
  - radiation patterns of, errors in lens measurements of, 2110
    - photographic method for demonstrating, 2650
  - receiving, theory of, 819
  - slot, impedance/frequency characteristics of, (D)574
    - pattern synthesis methods for, (A)2642
    - survey of, 2922
    - theory of, (C)2344
  - slotted-waveguide, 815
    - nonresonant, theory of, 2641
  - spherical, with nonequatorial feed, radiation properties of, 2343
  - television, receiving, design and production of, 1845, slot, indoor, 2559
    - transmitting, folded-dipole, temporary, at London station, 1076, supergain problems of, 2918, supergain and superturnstile, 2919
  - theory of, using vector wave functions, 3035
  - tower, sectionalized, broadcasting, performance of, (A)2270
  - transmitting, medium- and long-wave, 2341
    - 15–300-kc/s, (A)2642
  - u.s.w., radiation from, 2109
  - vertical, directivity due to parallel parasite, 41
  - wide-band, and compensation circuits, 1310
    - folded-slot, 570
    - for m and dm waves, 572
    - omnidirectional, for decametre and metre waves, 571
- **Aircraft** traffic control systems, analysis of, (A)2186
- **Alloys,** (See also Ferromagnetic materials; Magnetic materials)
  - Co-Cu and (Fe/Ni)-Cu, properties of, 655
  - Mn, ferromagnetic interactions in, 915
  - Ni, for oxide-coated cathodes, 3033
  - permanent-magnet, alnico V, magnetic properties of, theory of, 657
    - anisotropic, magnetic properties of, theory of, 658
    - magnetostriction and coercive force in, 127
  - resistance, temperature variation of, 2751
- **Altimeter,** radar, airborne, for surveying, datum correction for, 1655
- **Ammeters,** calibration above 100 Mc/s, (A)1958
- **Amplification,** by deceleration and acceleration of single-velocity beam, 2068
  - logarithmic, of weak currents by means of diodes, 2228
- **Amplifiers,** a.f., comparison of triodes and beam tetrodes, 1123, (D)2959
    - direct-coupled, 15-W, 2134
    - for F.A.S. system, 805
    - positive feedback in, 850
    - power, with variable output impedance, 2681
    - push-pull, extended class-A, 2680, single-ended, (A)2082
    - RC, with independent control of selectivity and bandwidth, 2395
    - selective, for null detector, 2390
    - tunable, variable-selectivity, 600
    - Williamson, using Type-6A5 valves, 311, very-high-fidelity, 1334
  - a.f., d.c., and pulse, maximum permissible grid-leak resistance for, 2683
  - anode-load compensation for, 304
  - background noise in, 1333
  - band-pass, with equal-ripple response, design of, (A)2122
  - buffer, neutralized, 1·7–2·4 kMc/s, (A)2122
  - class-C, with reactive load, calculations for, (A)2122
  - d.c., for biological application, 75, (C)848
    - drift compensation in, (A)2220
    - evolution of, 2884
    - using magnetic modulators, 152, (A)682, (A)2123
    - mains-driven, for photocell measurements, 2777, sensitivity limit of, 1602
    - reflex, for portable ionization-chamber instruments, 2797
    - wide-band, stabilized, 849
  - d.c. and v.l.f., valve noise in, 2879
  - differential, with bridge network for interference suppression, 2394
  - direct-coupled, feedback, compensation of zero-drift errors in, 1867
    - frequency-compensated, for 4-channel pen-recorder, 1603
    - h.f., (A)2122
    - 'starvation' circuits for, 1868
  - distributed, (A)2122
    - power and voltage, 314
    - wide-band, pulse, (A)2122
  - dynamoelectric, 46
    - Class-A operation of, 829
  - feedback, graphical solution for, 316
  - for f.m. signals, design of, 2388
  - grounded-grid, analysis of, 845
  - harmonics and intermodulation frequencies in, 2956
  - i.f., distortion in, graphs and abacs for, 1122
  - l.f. and m.f., Ge triodes in, 2958
    - measurement of gain and phase shift of, 1723
  - logarithmic, wide-band, 3063
  - magnetic, (D)1094, (D)1582
    - characteristics of, 1092, 2116
    - core materials for, 49
    - design of reactors for, 2361
    - design technique for, (A)2122
    - feedback in, 1091, analysis of, 47
    - high gain, with self-excited transductor, 2360
    - with self-saturation, 830, transient response of, (A)2122
    - series-connected, (D)1093, (D)1581
    - theory of, 48, (A)582
  - microwave, using Type 1553-416A triode, 310
  - miniature, for sound-broadcasting pickup, 312
  - mixer, klystron, application to television relaying, 256, 3127
  - with negative-resistance load, (D)599
  - network representation of admittances of, (D)2392
  - pentode, quiescent voltages and currents in, 77
  - for pickups, input circuits for, 594
  - pulse, comparison of various types, 1866
    - for proportional counters, A.E.R.E. Type 1049B, 847
    - theory of, 76
    - with voltage doubling by transmission-line reflection, 1600
  - push-pull, 'cathamplifier', 78
  - RC-coupled, bandwidth of, 1336
  - relay, selective, for recording WWV time signals, 74
  - resistance-coupled triode, maximum output from, 2393
  - r.f., design for low noise figure, (A)2122
  - selective-feedback, 1124
  - 'sensitivity factor' of, 2478
  - for slowly varying very low voltages, 1335
  - television. See Television.
  - transistor, graphical analysis for, 1101
  - travelling-wave, applications of, (A)2270
  - video, coupling by Π-section filters in, 590
    - wide-band, design of, 319
  - wide-band, for central-aerial installations, 1601
    - for c.r.o. observation of transients, 315
    - design of, 2679
    - linearization of frequency response by negative feedback, 1871
- **Analogues,** electrical, of linear systems, 58
- **Analysers,** for aerial polar diagrams, 282
  - amplitude-distribution, storage tubes as, (A)2226
  - frequency-spectrum, C.I.T., for 1–100 kc/s, 3057
    - for high frequencies, 3049
    - Philips Type SFM 101, 1964
    - for radio signals, 167
    - for radiotelegraph signals, 3056
    - for very low frequencies, 1720
  - harmonic, giving Fourier coefficients, 144
  - for velocity and density distribution in electron beams, (A)2226
  - pulse-amplitude, 99-channel, for slow counting, 1085
  - pulse-height, differential, for scintillation counters, 578
    - for proportional and scintillation counters, 2357
    - single-channel, 1577
- **Analysis,** correlation, (See also Mathematics)
    - application, to p.t.m. systems, 1487, to reception in noise, 780
  - harmonic, by search-tone method, 532
  - spectrum, of f.m. signals, 2834
- **Antimony,** plated, as substitute for Ni and Cr, 1950
- **Astronomy,** radio, (See also Cosmic noise; Solar radiation)
    - C.S.I.R.O. work on, 2421
    - equipment and techniques for, 2699
    - review of, 1363, 2698
- **Atmosphere,** (See also Absorption; Ionosphere; Troposphere)
  - circulation of, and effect on geomagnetic field, 1369
  - ionization in, sources of, 894
  - microwave refractive index of, fluctuations in, 2176
    - recorder for, (A)1958
  - refractive index of, phase-shift measurement of, 2472
  - scale-height gradient, and effects on ionization and s.w. absorption, 1644
  - upper, nomenclature for, 876, 1642, (D)1643
  - vertical distribution of ozone in, 1376, 1640
- **Atmospheric electricity,** charges on particles of mist or rain, measurement of, 355
  - measurements of field in Greenland, 1153
  - semidiurnal fluctuations of potential gradient, 1906
- **Atmospherics,** c.r. direction finder measurements in *Commandant Charcot*, 637
  - and lightning discharges, 638
  - measurements of, in l.f. band, in South Africa, 438
    - subjective, 169
    - at 170–204 kc/s, 1387
    - at 1·93 Mc/s, near Darwin, Australia, 1764
    - at 2·5–20 Mc/s, 203
  - produced by electric discharges in snow squalls, 1910
  - propagation of, 1652
  - reflection by ionosphere at night, 2184, 2185
  - statistical relation on receiver tuned to 27 kc/s, 1651
  - and study of propagation of very long radio waves, 1473, 1760
  - waveform of, c.r.o. for observation of, 2717
  - West African source of, 637
  - work of the Australian Radio Research Board on, 1999
  - 4-station observation network in the Caribbean area, 114
- **Attenuation,** of cm waves, measurement of, 841
  - in waveguides, precision measurement of, (A)1958
- **Attenuators,** cascade connected, mismatch error in, abac for, 317
  - piston and dissipative, corrections for, (A)1958
  - single-input, with multiple outputs, 1590
  - tuning, high power, for cavity resonator, 1859
  - for waveguides, calibration and use of, 1565
- **Audiometers,** calibration of, 1054
  - performance of, 1053
- **Aurora,** and anomalous propagation phenomena, 2002
  - correlation with increased cosmic-ray intensity, 2992
  - entry of protons into atmosphere during, 636
  - and geomagnetic storms, corpuscular theory of, 877
    - proposed laboratory investigation of, 1639
    - theory of, 1374, (D)2993
  - ionospheric reflection of h.f. waves during, 1649
  - Martyn's theory of, (A)2712
  - in North America, southern limit of, 1908, (A)2712
  - southward shift during magnetic storms, 873
  - spectrograms of arc over Arnprior on 30th Sept. 1950, 1650
  - spectrum of, and physics of ionosphere, 1151
  - on 19th Nov. 1949, and radio wave propagation, 2716
  - on 20th–21st Feb. 1950, ionospheric disturbance due to, 1150

B

- **Barium titanate.** See Ferroelectric materials.
- **Batteries,** accumulator, for very low temperatures, 1493
  - dry, developments in, 3121
  - light-weight, developments in, 3120
  - primary, recent patents, 233
  - for Service use, 232

  - Weston standard cells, variation of e.m.f. of, 2287
- **Beacons.** See Navigation aids and Radar.
- **Bibliography,** (See also Acoustics)
  - of sonic and ultrasonic applications, 1818
- **Blind,** guiding aids for, 1444
- **Bolometer,** Bi-film, short time-lag, 3059
  - wide-band, development of, (A)1958
- **Book notices and reviews,** The Acceleration of Particles to High Energies, 190
  - Alternating Current Circuits, 2298
  - Antenna Theory and Design, 1081
  - Antennas, 1574
  - Basic Electrical Measurements, 1973
  - Bauelemente der Nachrichtentechnik, Teil 1, Kondensatoren, 851
  - Bruits Radio-Electriques Solaires et Galactiques, 115
  - Calcul Opérationnel, 389
  - Calculating Instruments and Machines, 936
  - A Comparison of the Flame Retardant Properties of Plastics-Insulated and Rubber-Insulated Electric Cable, 1414
  - Consol—A Radio Aid to Navigation, 901
  - Corona and Breakdown at Frequencies up to 12 Mc/s, B.E.A.I.R.A. Technical Report L/T229, 1624
  - Differential Equations, 149
  - Die Differentialgleichungen der Technik und Physik, 148
  - Drahtloser Überseeverkehr, 2283
  - Einführung in die Funktechnik, 1287
  - Electric Circuit Theory, 320
  - Electrical Communication, 454
  - Electrical Engineers' Handbook—Electric Communication and Electronics, 2607
  - Electrical Measurements and the Calculation of the Errors Involved, Part 1, 2490
  - Electrical Transmission of Power and Signals, 2076
  - Électricité, 2981
  - Electromagnetic Fields, Theory and Applications, Vol. 1, Mapping of Fields, 859
  - Electromagnetic Problems of Microwave Theory, 2113
  - Electromagnetic Theory, Vols. 1, 2 and 3, 622
  - The Electron Microscope, its Development, Present Performance and Future Possibilities, 1992
  - Electron Tubes, Vols. 1 and 2, 1039
  - Electronic Engineering Master Index, 1949, 1286
  - Electronic Equipment Construction, 2081
  - Electronic Fundamentals and Applications, 2883
  - Electronics in Engineering, 426
  - Electronics Manual for Radio Engineers, 1750
  - Electrons and Holes in Semiconductors, 2463
  - Die elektromagnetische Schirmung in der Fernmelde- and Hochfrequenztechnik, 602
  - Elektronenoptik, 1751
  - Encyclopedia on Cathode-Ray Oscilloscopes and their Uses, 2491
  - Équations Intégrales et Transformations de Laplace, 2756
  - The Flight of Thunderbolts, 2718
  - Formulas and Theorems for the Special Functions of Mathematical Physics, 146
  - Fortschritte der Funktechnik und ihrer Grenzgebiete, Vol. 7/8, 1288
  - Frequency Modulation, 991
  - Fundamentals of Acoustics, 1561
  - Grundlagen der Höchstfrequenztechnik, 3191
  - Grundzüge der Tensorrechnung in analytischer Darstellung, Teil 1, Tensoralgebra, 388
  - The Heaviside Centenary Volume, 2079
  - Heaviside's Electric Circuit Theory, 321
  - High-Frequency Voltage Measurements, 1974
  - High-Speed Computing Devices, 937
  - Induction Heating, 2515
  - The Industrial Applications of Gasfilled Triodes (Thyratrons), 2306
  - Industrial High-Frequency Electric Power, 716
  - Ionization Chambers and Counters, 1224
  - Laplace Transformation Theory and Engineering Applications, 3039
  - Mathematical Engineering Analysis, 3038
  - The Mathematical Theory of Communication, 455
  - Matrizen, 1955
  - Die Messung von elektrischen Schwingungen aller Art nach Frequenz und Amplitude, 2238
  - Die Messung von elektrischen Spannungen und Strömen aller Art vom Gleichstrom bis zur Hochfrequenz, 2239
  - Metallkeramik, 1690
  - Microwave Electronics, 1540
  - Micro-Wave Measurements, 1203
  - Most-Often-Needed 1950 Radio Diagrams and Servicing Information, 983
  - Negative Ions, 1883
  - The Nomogram, 1423
  - Non-Linear Vibrations in Mechanical and Electrical Systems, 390
  - Numerical Mathematical Analysis, 1957
  - Operational Calculus, based on the Two-sided Laplace Integral, 1700
  - Operatorenrechnung und Laplacesche Transformation, 147
  - Ordinary Nonlinear Differential Equations in Engineering and Physical Sciences, 1956
  - Die Oxydkathode, 2. Teil, Technik und Physik, 2603
  - Photoelectric Cells in Industry, 792
  - Practical Television Engineering, 1011
  - Practical Television Servicing and Trouble-Shooting Manual, 762
  - The Practice of Electron Microscopy, 191
  - Primary Batteries, 748
  - Principles and Applications of Waveguide Transmissions, 1311
  - The Principles of Electromagnetism, 623
  - Principles and Practice of Radar, 3011
  - Protection of Transmission Systems against Lightning, 2112
  - Quartz Vibrators and their Applications, 2464
  - Radar Simply Explained, 1394
  - Radar Systems and Components, 2436
  - Radio Communication at Ultra-High Frequency, 742
  - Radio Engineering Handbook, 1289
  - Radio Laboratory Handbook, 3065
  - The Radio Manual, 794
  - Radio Research, 1933–1948, 1810
  - Radio Technology, 2078
  - Radio and Television Mathematics, 387
  - Receiver Circuitry and Operation, 3104
  - Receiving Tube Substitution Guide Book, 2072
  - Réception Radiophonique, Parasites, 2825
  - Registrierinstrumente, 3064
  - Semi-Conductors, 2420
  - Short Wave Wireless Communication, 2080
  - Static and Dynamic Electricity, 2165
  - Super-regenerative Receivers, 735
  - Survey of Modern Electronics, 2514
  - Table of the Bessel Functions $Y_0(z)$ and $Y_1(z)$ for Complex Arguments, 835
  - Techniques Générales du Laboratoire de Physique, Vol. 2, 1174
  - Telecommunications Principles, 2884
  - Television, Vols. 5 and 6, 2038
  - Television Servicing, 495
  - Testing Radio Sets, 1204
  - The Theory and Design of Inductance Coils, 603
  - Theory of Electrons, 2982
  - Theory of Hearing, 1298
  - Threshold Signals, M.I.T. Series Vol. 24, 1234
  - Time Bases (Scanning Generators), 2492
  - Transformers, 1337
  - Transmission Lines and Filter Networks, 2995
  - Transmission Lines and Networks, 2355
  - Traveling-Wave Tubes, 511
  - Le Tube à Rayons Cathodiques, 2880
  - Ultrahigh-Frequency Engineering, 2077
  - Ultrasonics, [illegible]
  - Vacuum-Tube Voltmeters, 3066
  - Valve and Circuit Noise, R.R.B. Special Report No. 20, 1806
  - Le Vide et ses Applications, 1413
  - Voltage Stabilizers, 1255
  - Wave Motion and Sound, 1562
  - Wireless Servicing Manual, 2008
  - Die wissenschaftlichen Grundlagen der Raumakustik, Vol. 3, 2904
- **Breakdown,** (See also Discharge)
  - in compressed air, between coaxial cylinders, 1616
    - with high relative humidity, 1136
  - dielectric, sound waves due to, X-ray investigation of, 86
  - of gases, at h.f., 613
    - at u.h.f., effect of magnetic field on, 1134
  - h.f., of air, (A)2194, positive ion formation prior to, 2144
  - over insulators in high vacuum, 2454, 2747
  - spark, of compressed gases, 333
- **Bridges,** a.c., automatic, 1715
    - effects of earth admittances in, (D)1433
    - for measurement of very high resistance at high voltage, 2229
  - a.f. selective amplifier as null-detector for, 2390
  - bolometer, Type 1651-A, for h.f. power measurement, 410
  - capacitance, h.f., 1717
    - high-sensitivity, for investigating polymerization, 2240
  - distortion-factor, calibration of, 164
  - Schering, for voltages to 200 kV, 1716
  - s.w.r., for 1·5–42 Mc/s, 948
  - Wien, modifications in, 403
- **Broadcasting,** (See also Aerials)
  - National Broadcasting Service, Australia, 1248
  - report of Broadcasting Committee, 1949, 2282
  - in South Africa, development of, 3118
  - stereophonic, French experiments on, 1061
    - of music, 1060
  - stratovision tests in U.S.A., 242
  - studios, (See also Acoustics)
    - Montreal, master-control facilities for, (A)2270
  - and television, wire distribution system for, 2277
  - transmission-quality improvement for, 2622
  - u.s.w., f.m., low-frequency technique in, 453
    - in Western Germany, 2838
- **——stations,** B.B.C., list of, 2019
  - siting and design of, 3114
  - v.h.f., a.m. and f.m., B.B.C., Wrotham, Kent, 1779
  - WBSM, WBSM-FM, New Bedford, Mass., 1246
  - WKPT, WKPT-FM, Kingsport, Tennessee, 1247
  - 150-kW, medium-wave, at Daventry, 2542

C

- **Cables,** coaxial, characteristics for signals of 20-Mc/s bandwidth, 27
    - Paris-Toulouse, level regulation on, 2832
  - effect of connectors on propagation characteristics of, 2634
  - r.f., heating of, 28
    - power rating of, 26
  - for sound-distribution systems, 2905
- **Calculating machines.** See Computers.
- **Cameras,** (See also Optical systems, Schmidt; Television)
  - 10^8 frames/sec, 747
- **Capacitance,** of cube, calculation of, 1623
  - measurement of, effect of inductance in, 1961
    - f.m. in, 396
  - of parallel plates with anisotropic dielectric cylinder in torsion between them, (A)2164
- **Capacitors,** coaxial, $BaTiO_3$, for short-duration spark, 1222
  - electrolytic, a.c., 1100
    - capacitance and losses of Al_2O_3 layer in, 3022
    - tantalum, 296
    - temperature dependence of, 2750
  - high-power, with ceramic dielectric, 832
  - impregnated-paper, factors affecting life of, 1586
  - metallized-paper, 53
  - with parallel resistors, discharge of, 2970
  - styroflex, production and properties of, 2121
  - substandard, mica, N.P.L., stability of, 2938
- **Carrier-current systems,** (See also Communication systems)
  - power-line, f.m. in, 1485
    - for multistation control, telemetry and communication, 425
  - s.s.b., loss-compensated filters in, 1118
  - 48-channel, in Holland, 739
- **Carrier wave,** with f.m. by rectangular wave, bandwidth of, 1242
- **Cathode-ray oscillograph,** in broadcasting-station measurements, (A)2226
  - for curves with coordinate system, 3075
  - for dm waves, 408
  - for h.f. periodic phenomena, 949
  - microwave, (A)1958
  - for millimicrosecond measurements, 3054
  - for observation of transients, 165
  - travelling-wave, 1017
  - using Type-5RP tube, for impulse testing, (A)2226
- **——oscilloscope,** automatic beam blanker for, 405
  - fast sweep circuit for, 404
  - four-gun, (A)2226
  - using graphechon storage tube, 3055
  - for long-duration transients, 1718
  - 'stroboscopic', for frequencies to 50 Mc/s, 1434, 1435
  - vector voltage indicator, 166
- **——tubes,** (See also Television)
  - cathode-resistance stabilization of gun current in, 2596
  - coder for digital computer, (A)2220
  - dark-trace, and applications of, 1031
  - image formation in, 500
  - image-storage problems for, 480
  - ion traps for, 3183
  - monoformer, 1033
  - with post-deflection acceleration, 1032
  - screens, luminescence of, 1922
  - spot-distortion correction in, 1806
  - storage, (C)788
    - beam-deflection, e.s., 1034, sequential operation of, 1317
    - developments in, 1536
    - e.s., for on/off signals, 2064
    - graphechon, characteristics of, 3182
    - grid-type, 786, theory of, 787
    - recording, (C)3181
  - switch and storage types, 3180
  - travelling-wave, 503, (D)2048
- **Cathodes,** (See also Electron emission)
  - BaSr carbonate, effect of radioactivity on emission from, 2301
  - boride, [illegible]
  - coatings for, electrophoresis of, 3028
  - L-type, heavy-duty, 773
  - Ni and oxide-coated Ni, spectral emittance of, 1026
  - oxide, BaO-SrO-CaO system, pulsed emission of, 2055
    - BaO-on-W, interface compound in, 263, 2053, 2054
    - bombardment-enhanced emission from, 3152
    - deterioration at low duty-factor, 1526
    - effect of coating composition on emission of, 1025
    - growth of resistive barrier in, 3168
    - leaky-capacitor interface in, 2052
    - Ni alloys for, 3033
    - Ni and Ni-Mg as base metals for, 1527
    - photoelectric effect in, 1027
    - poisoning by atmospheric sulphur, 2051
    - radioactive elements in study of, 505, 1522
    - secondary-emission, high-stability, 2582
    - spectral emissive power of, 1525
  - thoria, base-metal effects on, 1028
    - emission changes in, 504, 774, 1523
    - pulsed emission of, 3169
  - tubular, small, manufacture by electro-deposition, 678
  - tungsten, evaporation rate of, 1029
    - positive emission from, 2570
- **Charts,** (See also Abacs; Nomogram)
  - control, for analysis of experimental data, 2074
  - *Electronics* reference sheets, selected, 1284
  - impedance, for transmission lines, 1071
  - inductance, for solenoid coils, 1098
  - for mixer harmonics, [illegible]
  - for pulsed video input of cathode-follower circuit, 313
  - reactance, and applications, 1064
- **Chronograph and chronoscope,** for comparison of quartz clocks, 2471
- **Circle diagrams,** for analysis of coupled networks, 2665
- **Circuit analysis,** nonlinear method of, 585
- **——diagrams,** and wiring, correlation of, 2379
- **——theory,** (See also Networks)
  - effective and circuit bandwidths, 55
  - simplifying assumptions in, 54
- **Circuits,** (See also Networks)
  - absorption, tuned, analysis of, 62
  - a.g.c., a.f., for broadcasting transmitters, 318
  - and assemblies, miniaturization techniques for, 307
  - cathode-follower, as balance indicator in photometry, 2513
    - chart for pulsed video input of, 313
    - graphical study of problems of, 1865
    - response to pulse and sawtooth signals, 946
    - as voltage regulators, 231
  - clipper, cathode-coupled, speed of response of, (A)2122
  - coincidence, distributed, for scintillation counters, 1599
  - compensation, resonant, for wide-band aerials, 1319
  - coupled, double-tuned, for oscillator application, (A)2122
    - principles of measurement of, 898, (C)930
    - pull-in effect in, 2674
    - rolling-ball analogue of, (A)1114
    - triple-tuned and quadruple-tuned, design of, 2123
    - tuned, with passive quadripole coupling, 2945
  - detector, phase-sensitive, with high balance stability, 2780
  - flip-flop, Eccles-Jordan, transition in, 2119
    - with three stable states, 2367, (D)2937
  - frequency response of, vector diagrams for, 1578
  - integrator, for counters, 1462
  - LRC, series, with sinusoidal variation of L, 1330
  - lumped LC, and resonant transmission lines, bandwidths of, 1107
  - nonlinear, effect of initial phase on oscillations in, 2673
  - oscillatory, coupled, input impedance of, 2384
    - noise limitation in, 2960
  - pentode, G curves for design of, 826
  - phase-inverter, cathode-degeneration, 298, 1865
  - printed, (See also Components)
    - production and assembly techniques for, 1329, 1593
  - pulse-sharpening, 2375
  - RC, using nonlinear resistors, calculation of, 2356
  - scaler, magnetic, 1318
  - selector, pulse-amplitude, for counters, 577
  - superposed, definition and characteristics of, 592
  - sweep, fast, for c.r.o., 404
  - switching, electronic, speed of, (C)294
  - trigger, transistor, 2861
  - valve, representation by matrix, 2806
- **Clocks,** quartz, using NH_3 absorption line, 1355, N.B.S., improved, (A)1958
  - tuning-fork controlled, for broadcasting studios, 2757
- **Clouds,** height measurement with light waves, 2498
- **Clutches,** magnetic-fluid, 1748
  - magnetic-powder, 456
- **Coils,** (See also Inductors)
  - choke, for regulation, design chart for, 2659
  - cylindrical, external reluctance of, 2658
  - dust-cored, high-*Q*, for range 100 c/s–100 kc/s, 584
  - repeater, double-humped resonance curves of, 1088
  - shielded, characteristic impedance of, 2118
  - solenoid, inductance charts for, 1098
    - single-layer, surge effects in, 1099
    - water-cooled, 100-kW, 1097
  - universal winding machine and winding patterns for, 1854
- **Colour,** fundamental theory for television engineers, 1610
- **Communication,** theory of, and air-traffic control system design, 2274
    - application of electronic correlator in, 1237
    - and assessment of modulation systems, 2017
    - autocorrelation and entropy in, 3105
    - coding, of multiplex transmissions, 2333, for picture transmission, (A)2270
    - comparison of television with other communication methods, 2028
    - correlation functions in, (A)679
    - cross-correlation and optimum signal/noise ratio for periodic systems, (A)2265
    - and definition of information, 2273
    - and determination of electronic system parameters, (A)2270
    - diffraction and quantity of information, 209
    - geometrical interpretation in Hilbert space, 2584
    - and human ear, 2818
    - information and entropy, 2009, 2010
    - information and regression, 2272
    - matching of message to transmission line, 2271, 2827
    - and measurement systems, 3041
    - and physics, 208, 1484
    - relation between quantity of information in Fisher and in Wiener sense, 1769
    - signals with limited spectra and their transformations, 210
    - and speech communication, (A)737, 1238
    - and telecontrol, telemetry and measurement, 2535
    - and telephony quality analysis, 1486
    - and transmission cost, 2828
    - waveform detection by cross-correlation, (A)2265
- **——equipment,** (See also Receivers; Transmitter-receivers; Transmitters)
  - for British civil-aviation area-coverage network, 2544, transmitter for, 2545
  - for French armed forces, 2540
  - military, for Malaya, 1781
  - mobile, for 152–174 Mc/s band, design of, 989, 1782
  - for 450 Mc/s, 2278
- **——systems,** (See also Carrier-current systems; Radio links; Radiotelegraphy; Radiotelephony; Relay systems; Telephony)
  - a.m., s.s.b., suppressed-carrier, (A)2270
  - carrier-telephony, 12-channel, for open-wire line, 2537
  - for civil aviation, 2274
    - general survey of, 2434
    - v.h.f., arrangements for southern England, 2016
  - for civil defence, New York City, 1771
  - through ground, using e.s. field, 2275
  - h.f., s.s.b., 2014
  - microwave, reflected-ray suppression for, 1944, (A)2799
  - mobile, for British Electricity Authority, 1775
    - v.h.f., planning of, (D)987
    - in Zürich, 3116
    - 82–1400 Mc/s, tests in railway tunnels, 990
  - mobile and point-to-point, v.h.f., 2541
  - multichannel, interference in, 986, (C)1780, 3180
  - optimum junction points in networks, 2839
  - ph.m., with s.s.b. reception, (A)2270
  - p.t.m., application of autocorrelation analysis to, 1487
    - choice of electronic commutation methods for, (A)2270
    - multiplex, 214, a.m., crosstalk in, 740, 2830
  - storage devices for, 1235
  - for Sydney Water Board, 2276
- **Components,** and circuits, die stamping of, 1592
  - and electronic equipment, manufacturers of, directory of, 1126
  - miniaturization techniques for, 2947
  - subminiature, in equipment design, 839
- **Computers,** analogue, C.I.T., application to nonlinear mechanics, 143
    - for complex vibration problems, (A)189
    - differential analyser, electronic, time-division multiplier for, (A)2220, mechanical, 3037, special devices for, (A)1183
    - drift-compensated d.c. amplifiers for, (A)2220
    - for eigenvalues and eigenvectors of symmetrical matrix, 1699
    - for Fourier analysis and synthesis, 1696
    - general-purpose, 1953, operation of, 1954
    - long-time and short-time, comparison of, 142
    - multiplier units, 1419, high speed, (A)60
    - photoelectric, 1187
    - product integrator, high-speed, (A)2220
    - sampling, (A)2220
    - for solving systems of linear equations, 2469
  - analogue and digital, definitions of terms, 50 IRE 8S1 standard on, 2222
  - correlator, electronic, digital, for application in communication theory, 1237
  - digital, a.f.c. of clock pulse frequency in, 2364
    - asynchronous control for, (A)2220
    - binary, ACE, at N.P.L., 1420, addition and subtraction units

for, 1697, c.r. screen storage system for, (D)680, mathematical bases for, 1182
c.r. coder tube for, (A)2220
design and construction of, 1181
digit storage using magnetic cores, 1421, 1422, (A)2220
EDSAC, diagnosis of mistakes in, 2755
ENIAC, valve maintenance in, 3163
electronic, construction of, 1184
high-speed, small-scale model of, 1952, saturable reactors in, (A)2220
N.B.S. programme on, 386
plug-in units for, (A)2220
programme-controlled, review of, 2221
punched-card, chemical application of, (A)1749
Raytheon, selection matrix input-column driver for, (A)2220
reliability of, marginal checking as aid to, 1185
SEAC, 385
small-scale, (A)2220
step-by-step integration in, 1695
visual display of binary numbers in, 2468
logical, design and applications of, 2467
Conductivity, electrical, of ionized gases, 335, (D)2404
measurements at 9 kMc/s, 394, 395
of metal films, theory of, 1397
of metals, size effect in, 328
of non-metals, 1665
of solids, theory of, 1342
electrical and thermal, in metals, theory of, 327
thermal, of (Ba Sr)O, 917
Conductors, helicoidal, equipotentials of, electrolyte-tank measurements of, 1196
Conferences and conventions, calculating machines, Paris, January 1951, 1698; electron microscopy, Paris, September 1950, 1987; electronic components, Washington, May 1950, 840; ferromagnetism and antiferromagnetism, Grenoble, July 1950, 617, 2731; German Society for Electron Microscopy, 2nd session, April 1950, 2257; h.f. measurements, Washington, 1951, 1703; I.E.E. symposium on M.K.S. system of units, March 1950, 322; Institute of Physics, vacuum physics, Birmingham, 1950, 641; International Convention on ultrasonics, Rome, 1950, 10; magnetic materials, Washington, 1948, 49; r.f. spectroscopy, Amsterdam, 1950, 1356; Royal Society, information theory, London, September 1950, 984, 2011, 2583; semiconductors, Kiev, 1950, 2728; electronics symposium, 1950, 420, 1209
Connectors, for coaxial transmission lines, 2906
Contacts, electrical, and powder metallurgy, 923
Control, (See also Electronic applications; Frequency; Servomechanisms; Telecontrol)
automatic, for carriage of ship-model testing tank, 418
electro-analogue for study of, 2782
of home heating, 1205
process, electronic relays in, (A)2245, general discussion of, 2242
simulator for, (A)2245
industrial, design of electronic apparatus for, 2781
——**systems,** (See also Servomechanisms)
and application in industry, 2494
feedback, inaccuracies in, 223
general theory of, 2022, 2023
Converters, (See also Frequency converters)
d.c./a.c., using magnetic modulator, 2114
negative-impedance, theory of, 1323
u.h.f., design of, 442
vibratory, increase of power rating of, 1783
Cores, ferrite, high-μ, measurements on, 2736
magnetic-particle suspensions in oil, 2749
Cosmic radiation, r.f., (See also Astronomy, radio; Noise, microwave)
from galaxy, and cosmic magnetic fields, 2989, 2990
cosmic rays as source of, 1142, 2166, 2424
discrete sources of, 865
fluctuations of, 1365, 1366, 2172, effect of ionosphere on, 1634
and galactic structure, 866
origin of, 1364
at 100 Mc/s, 348
at 200 Mc/s, 867
from great nebula in Andromeda, 629
survey of work on, 1627
at 205 Mc/s, from Cygnus A, 2703
——**rays,** and aurora, 2992
correlation with solar and galactic radio noise, 1142, 2166, 2424
from galaxy, origin of, 1364
intensity change after solar disturbances, 1635
intensity increase after solar flare, 1890
and radio fade-outs, 1763
variations and origin of, 2991
——**theory,** magneto-hydrostatic fields, 1892
Counter tubes, cold-cathode, 783
gas-filled, multi-cathode, 784
Counters, coincidence, effect of cooling on, 3084
counting-rate meter, 2258
logarithmic, 2258
and counting systems, 2258
crystal, AgBr, 2511
diamond, 424
G-M, alcohol argon-filled, temperature varations in, 423
auxiliary circuits for, 1105
Co$_2$-filled, 2259
end-window type, 2258
with external cathode, discharge propagation in, 710
hydrogen-filled, 186
l.v., halogen-quenched, 2258, time delays in, 2260
methane-filled, with external cathode, deterioration of, 933
resolving-time measurement for, 715
self-quenching, temperature dependence of, (D)187
spurious discharges in, 1990, temperature effect on, 714
for ultra-violet radiation, 3085
G-M and proportional, end effects in, elimination of, 1989
line-noise interference reduction for, 1744
proportional, calibration of, 713
and ion chambers, with external graphite electrodes, 709
pulse, binary, cascaded, with feedback, 2660
current integrators for, 1462
with outputs at several predetermined counts, 1585
ring, using neon lamps, 2120
scintillation, 2258
delay coincidence circuit for, 3086
end-window, for α particles, 1230
nuclear, 3087
resolving time of, statistical limitations on, 967
survey of, 2512
spark, Rosenblum-type, properties of, 1461
ultraviolet-sensitive, after-effects in, 188
vapour-filled, oversize pulses in, 1460, mechanism for, 2510
Couplers, directional, approximate theory of, 2099
with full power transfer, (A)2100
multi-element, (A)2100
Coupling, electromechanical, 808
equations for, symmetry in, (A)554
Crystals, (See also Piezoelectric crystals, Quartz)
alkali-halide, influence of plastic flow on properties of, 129
small, spherical, production of, 3030
zinc-blende, bombardment-induced currents in, 1140
Current, direct, small, measurement of, 1195
h.f., works instruments for measurement of, 3044
weak, logarithmic amplification by means of diodes, 2228

D

Demodulator, synchronous, 204
Detectors, crystal, and use at u.h.f., 775
Si crystal, manufacture of, 2070
Diamond, as counter, properties of, 424
dielectric properties of, 2210
Dielectric constant, of air, phase-shift method of measuring, 2472
at 24 kMc/s, 1707
at λ 10 cm, 3047
of ceramics, and dependence on porosity, 380
of fibres, microwave measurement of, 686
of nonpolar fluids, experimental data on, 669
theory of, 609
static, of dipolar solids, 2195
at u.h.f., null method for measurement of, 1429, 1430
——**loss,** measurement at h.f., with rising temperature, 151
——**measurements,** application of double-superheterodyne principle to, 1960
interpretation by Cole-Cole plot, 1406
——**properties,** of diamond, 2210
of dioxan-water mixtures, 3027
of gases, at 9 kMc/s, 1426
of inorganic crystals, effect of adsorbed water on, 2969
of ketones, 1941
of liquids, at dm λ, 3046
with polar components, 666
measurement of, with magic-T bridge, 3053
at u.h.f., for small samples, (A)1958
at 300–600 Mc/s, 2763
of media containing free charges, 1875
of NaNbO$_3$ and KNbO$_3$, 3023
of organic liquids, 3074
of polyethylene terephthalate, 667
at r.f., N.B.S. measurement of, 3045
of solid crystalline proteins, etc., 2968
of solid dielectrics, microwave measurements of, 2474
of solid HCl and DCl, 2742
special waveforms for study of, 2230
Diffraction, (See also Sound)
asymptotic treatment of, 2138
of cylindrical wave by perfectly conducting half-plane, 1130
of e.m. waves, by disks, 2412, 2693, and by circular aperture, 94
at open end of circular waveguide, 2337
by paraboloids of revolution, 820
by plane wire grating, 2966
theory of, 2694
by two parallel half-planes, 2414
general laws of, critical review of, 83
by irregular screen, and ionospheric reflection, 428
of plane e.m. waves, by disks and holes, 2160
by an edge, 1619
by paraboloid, 2413
by small holes, Bethe's theory of, 1874
of pulses, by wedges and corners, 2963
of sound pulse at open end of semi-infinite duct, 288
theory of, 323, 1129
exact solution of a class of two-dimensional problems, 1620
theory of radiation from horn, 2962
of 8-cm waves, by λ/2 rods, 2159
Direction finders, aural-null, accuracy of, 119
and twin-channel c.r., comparison of, (D)118
——**finding,** aerial systems for, (A)2642
c.r. equipment for, 896
at sea, 2188
Directory, of American electronic equipment manufacturers, 1126, 3189
Discharge, (See also Breakdown)
in air at atmospheric pressure, influence of electrodes in starting, 1615
arc, Hg, low-pressure, u.s.w., resonance phenomena in, 615
high-pressure, microwave study of, 1132
initiation by auxiliary spark, 2971
low-pressure, dynamic characteristics of, 1135
corona, d.c., electrical and optical characteristics of, 2145
positive and negative, starting potentials of, 2686
corona and Townsend-type, effect of variation of parameters in, 2143
gas, d.c., noise temperature of plasma in, 1133, r.f. noise in, 2974
determination of parameters in, 2972
h.f., 85, in magnetic field, noise in, 614
high-current, magnetic field of, 2146, ring, in H or Ar, 2147
low-pressure, theory of double layers in, 1345
microwave, 332
retroaction and similitude considerations in starting of, 1131
r.f. emission due to gyromagnetic effect, 1139
spark, in air and H, effect of cathode surface on, 2973
high-current, voltage gradients in, 852
phenomena of, 2402
recent research on, 1344
——**tubes,** Hg-vapour, 3-electrode, electric field in, 2874
Discriminators, cm-wave, and application to oscillator stabilization, 1596, 2758
crystal, for f.m. oscillator stabilization, 3145
linear, for f.m. telemetry, 2783
pulse-width, 2784
Distortion, amplitude, in diverging sound wave in air, (A)520
correction, for video delay lines, 52
of f.m. signals, by linear passive network, 2676
by long feeder lines, 43
harmonic, in iron-core transformers, measurement of, 2232
harmonic and intermodulation, in amplifiers and mixers, 2956
in i.f. amplifiers, graphs and abacs for, 1122
intermodulation, in frequency-division multiplex signals, (A)2265
measurement of, 2621
in long mismatched line, effects of, 42
meter, bridge-type, 688
in multichannel f.m. relay systems, 1489
nonlinear, automatic analysis of, (A)1811, 1836
in broadcasting transmitters, measurement of, 2568
effect on perception of mistuning of musical intervals, 289
in f.m. systems, 2835
in f.m. transmission, 448
graphical representation of, 1834
influence of high-order products on, 2892, (D)2893, (D)2894
in loudspeakers, 556
phase, in feeder lines, 1067
in phase modulation, 449
quantization, in pulse-count modulation, 1488

E

Ear, (See also Hearing)
cochlea, of guinea-pig, 1556, 1557
theory of action of, 1051, 1052
information capacity of, 2618
protectors, use of acoustic filters in, 1553
Education, for engineering, and non-technical aspects of industry, (A)2308
problems of, (A)2308
selection tests for students, (A)2308
professional, for development engineers in radio and electronics, (A)2308
Electrets, mathematical theory of, 608
Electrical constants, of ground, derivation from field-strength measurements, 108
of sand at u.h.f., 2211
Electrification, static, Volta effect as cause of, 1612
Electroacoustics, definitions of terms, 51 IRE 6S1 standard on, 2310
Telefunken post-war developments in, 2327
Electrodynamics, independent notation system for, 89
reciprocity theorem of, 2690
nonlinear theory of, 618
Electroluminescence, new light source, 1341
Electrolyte tanks, factors limiting accuracy of measurement in, 1713
Electromagnetic field, associated with cavity moving in magnetic field, 90
of helix, 1349, 1350, 2691, 2978
microwave, photographic techniques for measurement of, (A)1958
in slot-excited half-space, (A)2100
of vertical dipole above semiconducting earth, 82
——**induction,** in semi-infinite conductor, 1617, 2158
——**interaction,** Wheeler and Feynman's theory of, 1137
——**theory,** current distributions on large reflecting cylinders, (A)2685
forces between sphere and wire, 2140
forces between two current-carrying conductors, 89
Huyghens' principle for e.m. wave, 2695
method of separation of variables in, 2103
Electrometers, balanced-circuit design for, 3051
ultrasensitive, design of, 1967
using vibrating-plate capacitor, 159
Electron beams, magnetic-field focusing of, 964
high-energy, radiation from, applications of, 2411
under influence of dynamic field, 854
paraxial, energy flow distribution in, 616
quantum effects in interaction with e.m. field, 2149
space-charge effects in, reduction of, 1013
transit-time phenomena in, 1088, 2071
——**diffraction,** applications in valve technique, 1735
——**emission,** (See also Cathodes)
from carburized W and Mo, 1670
from metal surfaces, as after effect, 3151
Schottky effect for polished Ta, 1931
secondary, from Ag-Mg surfaces, effect of oxide-coated cathodes on, 2056
from Al$_2$O$_3$, 2569
of bombarded Ni-Ba mixtures and Rb, 1399
and design of television cameras, 1499
influence of silicone-oil vapour on, 2740
from insulators, energy distribution of, 1347, 1511
from Ni, Mo, MgO and glass, temperature variation of, 3150
from thin films of CaCl$_2$, 2403
time delay of, 1014
systems, spherical aberration of, 1977
thermionic, bombardment-enhanced, 3152
from refractory materials, including ZrC, 1400
simplified calculations for, 1877
survey of, 2571
from ThS, 919
——**flashes,** generation and application of, 3069
——**flow,** in presence of positive ions, stability of, 611
——**guns.** See Cathode-ray tubes.
——**inertia,** 2967
——**interactions,** magnetic, in plasma, 2975
——**lenses,** apochromatic, 182
crossover properties of, 785
with cylindrical equipotentials, analysis of, 2256
elliptical astigmatism of, measurement of, 701, 702
e.s., electron-optical properties of, 1984
with elliptical central electrode, 2793
field in, fine structure of, 181
with helical axis, 1985
potential and field of, 1456
with thick central electrode, theory of, 1455, 1742, 2500
e.s. and magnetic, low-power, general properties of, 3082
rotating beam method for investigating optical properties of, (A)2245
magnetic, with bell-shaped field, optical parameters of, 705
constants of, 703, (C)2504
image formation in, 3081
optical parameters of, 1454
reduction of spherical aberration in, 183
short, optical strength of, 2795
spherical-aberration correction by conducting foils, 1219
strong, with Newtonian image-formation equation, 2505, 2796
——**microscopes,** condenser aperture device for, 1453
determination of resolving power by Fresnel diffraction, 706
electron scattering and image formation in, 966, 2502
focusing in, 1218
intermediate lens for increasing magnification range of, 185
with magnetic lenses, ratiometer for, 1217
objective for ultrathin sections, 1740
permanent-magnet type, 1457
production of spider-thread grids for, 1452
representation of atomic distances by, 2501
schlieren optics in, 1451
small, 965
survey of commercially available models, 1986
Type-OSW, 1743
100-kV, Philips, 1458
——**multipliers,** (See also Photocells)
with crossed electric and magnetic fields, 2584
secondary-emission, voltage-controlled, 2583
statistical theory of, 1023
use in magnetometers of, 2765
——**optics,** deflection of extended image, 2503
demonstration apparatus for, 3083
foci and focal lengths in, 2505, 2796
focusing in crossed e.m. and e.s. fields, 704
general properties of image, 87
refractive index and connection with Routhian function, 1741
second-order beam focusing in magnetic fields, 184
of slightly deflected charged particles, 2794
——**plasma.** See Plasma.
——**trajectories,** graphical representation in moving reference system, 770
Electronic applications, (See also Control; Heating) accelerometer, vacuum-tube, improvements in, 1215; datum correction in radar-altimeter surveying, 1655; diaphragm-type micromanometer, 952, 1439; flight simulator for training B.O.A.C. pilots, 2247; h.f. torch, 2765; I.C. engine testing, (A)2245; measurement of internal friction of materials, 2246; measurement of yarn irregularities, 419; metal locator, 1197, 1979; microwave, in industry, 1980; in naval-construction research, (A)2249; organic analysis, 3074; process control of cable-core eccentricity, 417; production of half tone blocks, 2261; recording of high-speed phenomena, 3073; register control for packaging machinery, 2787; temperature control, 1195, for furnaces, 1734; thickness gauge for insulating coatings, 696; vibrotron transducer for pressure and temperature measurements, (A)2245
——**equipment,** design in relation to dry battery developments, 3121
and economy in use of scarce metals, 2937
production methods for, 2948, 2949, 2950
temperature rise in, estimation of, 2549
Electrons, fast, energy loss on passing through foils, 2792
Electrophoresis, coating surfaces by, 3028
Electrophotoluminescence, effect of temperature on, 644
of phosphors in intense electric fields, 902
Electroplating, of selenium, 671
Electrostatic fields, plotting by use of semiconducting paper, 1427
——**theory,** energy in systems containing dielectrics, 326
Electrostriction, in liquid dielectrics, theory of, 2141
Equalizers, a.f., continuously variable, Fairchild Type 627, 2129
attenuation and delay, for coaxial lines, 835
for coaxial lines, 836
design by synthesis technique, 1591
Evaporation, in vacuo, by direct bombardment, 3029
Exhibitions, components, Paris, 1951, 2672; Festival of Britain, radio equipment at, 2073; National Radio, Castle Bromwich, 1950, 266, 512; Physical Society, 1951, 2236; R.E.C.M.F., 1951, components, 2380; S.B.A.C., Farnborough, September 1950, 447; Swiss Industries Fair, Basle, April 1951, 3190; 2nd Audio Fair, 1043

F

Facsimile, coding schemes for, and communication theory, (A)2270
comparison of transmission systems for, 3124
'flying-spot' system for, Telefunken post-war developments in, 2551
f.m., high-speed, 461
G.E.C. equipment for, 1256
Italian system of, 237
photoelectric scanning and chromatic selection for designs in colour, 1258
transmission speed, 236
wire system, Finch, 3123
Ferroelectric materials, BaTiO$_3$, electromechanical oscillations in, 2449
h.f. losses in, 2458
jumps in conductivity of, 2447

permittivity of, 1404
properties and applications of, 133
single crystals, dielectric properties at low temperatures, 1945, elastic and electromechanical constants of, 918, 2450
temporary enhancement of hysteresis in, (D)2207
X-ray investigation of, 2448
crystals, elasticity of, 1683
$NaNbO_3$ and $KNbO_3$, 3023
$PbTiO_3$, phase transition in, 927
relation between permittivity and loss angle of, 1402
tartrates, 2209
titanates, 132
Ferroelectricity, theories of, survey of, 2451, 2725
Ferromagnetic materials, (See also Alloys)
alloys, Co/Mn, properties of, 3019
Co/Zn, β_1 phase of, 2735
Fe/Be_2, 2203
high-coercivity, dependence of magnetization on temperature of, 2407
Mn/In, 2442
Mn/Ni and Mn/Co, properties of, 2443
Ni/Fe, prepared by powder metallurgy, 2460
well ordered, properties of, 2444
alnico V, precipitation and domain structure of, 1672
theory of anisotropy in, 369
alnico and vicalloy, magnetostriction hysteresis in, 2733
ferrites, dispersion mechanisms in, 337
$Fe_2O_3.ZnO$, properties of, 1401
ferromagnetic resonance in, 1674
ferroxcube, application of, 2204
gyromagnetic phenomena in, 652
magnetization process in, 2205
measurement of Young's modulus for, 2737
Mg and Zn, mixed, properties of, 1673
properties and applications of, 368, 1934
for variometer cores, 1677
and ferrites, properties and applications of, 912
γ-iron oxides and ferrites, frequency variation of properties of, 1166
granular and aggregated, coercive field of, 654
gyromagnetic constant of, 1932
Hall effect in, 620, 2163
h.f. permeability of, 913, 1167
inhomogeneous, eddy-current method for investigation of, 1933
intermittent activation in, 2732
laminated, h.f. magnetization of, 1684
magnetite, granular, isothermal remanence of, 1671
Mn compounds, electrical conductivity of, 656, 2441
powders, Fe/Ni, coercive field of, 3017
properties and tests of, 1948
reversible susceptibility of, 1168
Si-Fe, domain boundary in, propagation velocity of, 855
single-domain structure in, 2406
surface photoelectric effect in, 2401
thin films, variation of properties with temperature and thickness, 1675
Ferromagnetism, domain structure, 336
electron theory of, energy bands in, 2154
laws of, 126
magnetization curves, 2689
in metal compounds, theory of, 2202
Field plotting, by fluid flow, 3040
Marton's electronic method of, 1459
——strength, (See also Television; Wave propagation, e.m.)
of broadcast transmission in v.h.f. and u.h.f. bands, 2281
calculation for u.h.f. aerial systems, 2814
fluctuations, of Swiss broadcasting stations, 2816
measurements for Tasmania/mainland R/T link, 1759
meter for 600 Mc/s, (A)1958
standards, v.h.f., 154
Films, (See also Sound recording; Sound reproduction)
Al_2O_3, capacitance and losses of, 3022
thin, Ag, resistance variation in strong electric fields, 651
Au, formation of, 2739
Bi, evaporated, Hall coefficient and resistivity of, 1403
Cs/Sb, photoelectric emission of, mechanism of, 643
dielectric, electron-bombardment conductivity of, 2196
ferromagnetic, variation of properties with temperature and thickness, 1675
Ge, evaporated, electrical properties of, 3021
of hydrocarbon, formed by electron or ion bombardment, 2738
insulating, in contacts, electric tunnel effect across, 2455
metal, effect of magnetic field on conductivity of, 331, evaporated, formation of, electron-microscope observations on, 659, resistivity of, 1397
Se, conductivity of, 1925
Filters, (See also Networks; Quadripoles)
acoustic, band-pass, variable, ⅓-octave, 1825
mathematical analysis of, 12
application of statistical theory to design of, (A)2122
band-pass, using corrugated waveguides, 2912
using double-tuned transformers in tandem, 2929
3-stage, variable-bandwidth, 2669
band-pass and band-stop, simplified design of, 2946
bridge-type, effect of circuit capacitances on, 1327
channel-separating, for waveguides, 2104
ladder, and a.f. and r.f. applications, 1112
attenuation equalization in pass band of, 1111
lattice, crystal, 2377
linear-phase-shift, video, 303
loss-compensated, in carrier-frequency systems, 1113
nonlinear, theory of, (A)2122
physical basis of, 621
Π-section, as coupling units for video amplifiers, 590
RC, electronic, (A)2122
pulse response of, (A)2122
twin-T, 2670, analysis of, 1857
using RC networks and d.c. feedback amplifiers, design of, 1325
reactance, design using Zobel X terminations, 1326
simplified design method for, 2127
theory of, relations between signals and spectra, 2376
time-domain, (A)2122
u.h.f., 1842
Fluctuations, (See also Noise)
spontaneous, survey of, 79
Fluorescence, of solids, effect of temperature on, 903
Fluxmeters, moving-coil, theory of, 944
Frequency, (See also Analysers; Analysis; Standard frequency)
bands, proposal for numbering of, 2269
changers, interelectrode feedback in, 1482
compression, theory of, 985
compressor/expandor units of French P.T.T., 306
control, automatic, of clock pulse frequency in digital computers, 2364, of mechanically tuned oscillators, 601, for s.s.b. receivers, 2003
of transmitters, evolution of, 1271
converters, gain-doubling, 1481
drift, of oscillators, meter for, 2484
generation and measurement of, (D)1188
measurement, a.f., precision oscilloscope method, 3050, stroboscopic, 2887
equipment for factory testing of crystals, 1721
R.C.A. commercial service for, 1965
near 50 c/s or multiples thereof, apparatus for, 1722
meter, heterodyne-type, 50 c/s–1 kMc/s, direct reading, (A)2226
for microwave spectroscopy, 1723
monitoring station, Pailton, for civil aviation, 170
stabilization, (See also Stabilization, frequency)
for aircraft communication equipment, 2853
standards, 2224
primary, u.f. crystal units for, (A)1958
quartz-crystal, (A)1958
tuning-fork, calibration of, 2234

G

Galactic radiation, r.f. See Cosmic radiation.
Galvanometers, a.c., amplifier coupling for, 2480
Gaussmeter, underwater, 158
Generators, (See also Oscillators; Signal generators)
complex-tone, for deviation tests, 1726
e.s., Van de Graaff, voltage regulation for, 1000
200-kV, 999
mm-λ, review of, 1598
narrow-pulse, 694, (D)2776
noise, diode, frequency range of, 3060
thermal, for 30 c/s–15 kc/s, 24
thyratron, for a.f. band, 25
pulse, with fixed repetition rate, 848
incremental-delay, 1725
for mμs range, 951
for radar-equipment testing, 2489
using saturable reactors, 2362
r.f., for industrial heating processes, 2496
square-wave, five-frequency, 50 c/s–500 kc/s, 3061
ultrasonic, high-power, and applications, 1976
magnetostriction, 2612
piezoelectric, with interchangeable crystals, 795
piezoelectric and magnetostrictive, high-power, 1544
quartz, with grid electrode, 2885
siren, high-power, 1822
30–80 kV, low-power, high-stability, 2506
500-kV, using Se rectifiers, 745
Geomagnetic storms, and aurora, corpuscular theory of, 877
theory of, 1374, (D)2993
effect on propagation of decametre waves, 2806
and effect on radio communication, 2994
Martyn's theory of, (A)2712
and solar activity, 1950, 1631
southward shift of auroral zone during, 873, (D)2710
April–Dec. 1949, 1375, Jan.–June 1950, 632, April–Sept. 1950, 874, July–Dec. 1950, 1896, Sept. 1950–March 1951, 2709
Geomagnetism, 'absolute quadrupole-moment', significance of, 110
correlation with solar activity, 2983
determination of radial variation of field, 351
disturbance of field by electric railways, 1145
diurnal variations, in equatorial regions, 2707
and ionosphere currents, 2713
effect of atmospheric circulation on field, 1369
K-indices, at Abinger, Eskdalemuir and Lerwick, Jan.–Dec. 1950, 2174
at Cheltenham, Oct.–Dec. 1949, 1371, April–June 1950, 631, July–Sept. 1950, 871, Oct.–Dec. 1950, 1895, Jan.–March 1951, 2706
at Niemegk, 2425
for Polar Year 1932-1933, 872
lunar diurnal variation at Val-Joyeux, 353
magnetic disturbances, international data, for third quarter 1949, 1370, for first quarter 1950, 630, for second quarter 1950, 870, for third quarter 1950, 1894, for fourth quarter 1950, 2705
origin of, [illegible]
production of 1950 world isogonic chart, 1893
and properties of intrusive rocks, 1638
secular variation in South Africa, 1939–1948, 1373
solar-flare effects on, 2988
sudden commencements, 352
at Alibag, 1372
and impulses, hourly frequency of, 2708
at Lerwick, 2175
Graph plotter, electronic, with c.r. tube display, 1216
Ground, a.c. resistivity of, 1193
electrical constants of, derivation from field-strength measurements, 109
Gyromagnetic effect, in discharge, r.f. emission due to, 1139

H

Hearing, (See also Audiometer; Ear)
aids, commercial, engineering technique for, 1840
design of, 23
nonlinear distortion in, (A)1811
standard, for testing, 1839
binaural, cerebral mechanisms involved in, (D)2889
comparison of sound pressures in earphone couplers and in ear, (A)1811
fatigue, short-duration effects in, (A)535
frequency selectivity of ear, (D)2617
influence of interaural phase on masked thresholds, 2619
perception of mistuning, effect of nonlinear distortion on, 269
upper frequency limit for human beings, (D)2322
Heating, dielectric, load matching in, 1208
induction, h.f., in metal evaporation, 2497, for motor-car parts, [illegible] 3077
of hollow metal sphere, 2244
r.f., of metals, 2786, vacuum furnace for high-temperature research on, 3078
work-coil for, 958
induction and dielectric, h.f., equipment design and applications in France, 178, 959
Heaviside, centenary meeting at the Sorbonne, May 1950, 1041
High-voltage generators. See Generators.

I

Ignitrons, construction and applications of, 1015
for welders, load-sharing circuit for, 1739
Impedance, (See also Aerials; Transmission lines)
acoustic, measurement of, apparatus for, (A)534
converter, for electrometer, 2117
matching, using h.f. line sections, 833
minimum-loss, abac for, 1587
theoretical limitations to, 1566
measurement of, by coaxial slotted line, 1963
by resonant coaxial line, (A)1958
at u.h.f., resonance method of, 684
at v.h.f., 1962
for waveguides and coaxial lines, by circular waveguide, (A)1958
at 50-1000 Mc/s, (A)2764
theory of, and Laplace transform, 2926
vector, measurement of, sweep-frequency method for, (A)1958
Impedors, with prescribed phase characteristics, 1576
Index, cumulative, for *Electronics*, 1930-1930, 3188
Inductance, self and mutual, of solid sphere within endless solenoid, 338
Inductors, (See also Coils)
iron-cored, carrying d.c., design of, 1096
magnetic circuits for, French P.T.T. standards for, 2934
Infrared, image-converter tube, use for high-speed photography, 2250, 3080
Insulating materials, (See also Ferroelectric materials)
ceramics, h.f. losses in, 2458
inhomogeneous, permittivity of, 380
physico-chemical phenomena in preparation of, 2457
deterioration and breakdown due to internal discharges, 1688
effects of contaminants on, 130
fluid, thermodynamics of, 1611
glass, power factor as function of composition, 3031
liquid, suspensions in, formation of conducting bridges in, 2688
mica, natural and synthetic, magnetic susceptibility of, 1687
synthetic, research on, 1946
mica substitute, terratex, for use in valves, 3161
paper, metallized, for capacitors, 134
plastics, outdoor weather aging of, 2453
polymers, rheological properties of, 668
polyvinyl alcohol, electric strength of, 2748
polyvinylchloride, 1944
random noise in, [illegible]
research and developments in, 1405
resistivity of, 131
Samica mica paper, 1407
and semiconductors, modern theories on, 375
solid, breakdown mechanism in, 2148
surface ionization of, investigation by Lichtenberg figures, 2456
synthesis of, 2746
tapes, effect of fungus growth on, 3025
varnishes, 928
Insulators, for overhead lines, r.f. conductance of, 379
Interference, adjacent-band, from transmitters, measurement of, 2762
adjacent-channel and co-channel, due to several signals, 443
German laws on use of h.f. equipment, 3103
from h.v. corona, 205, 3102
from ignition systems, in p.w.m., 761
in television, suppression of, 1504
theory of, 1233
line-noise, in particle counting, reduction of, 1744
in multichannel systems, 986, (C)1780, 3100
from r.f. heating equipment, reduction of, 206
sources on overhead power lines, location of, 1483
from television receivers, (A)2292
from television and f.m. receivers, 2006
Interferometer, Michelson-type, for mm wavelengths, 950
Interferometry, ultrasonic, satellite resonances in, 797
Ion beams, production by h.f. discharge, 88
Ionosphere, (See also Absorption; Atmosphere; Wave propagation, e.m.; Waves)
absorption of long and very long waves in, 974
over Calcutta, parameters for Jan. 1945–June 1950, 881
correlation between critical frequencies and stratosphere data, 1146
currents in, rocket investigation of, 2713
data, comparison for antipodal stations, 880
definition of virtual height, (A)2712
D layer, properties and formation of, 878
echoes from D and F_2 layers on 21·7 Mc/s, 1756
effects of solar flare, 19th Nov. 1949, 885, 1143
effects of solar flares, 1381
E layer, fine structure of, 2178
E_1 layer, attenuation of extraordinary component in, 887
electron density in, 2180
determination of, 2177
F layer, effect of solar eclipse, April 1949, 2996
effect of temperature on formation of, 2995
electron-density variations during solar eclipse, 20th May 1947, 886
observations at Tromsö, June 1944–April 1945, 1378
F_2 layer, ionization of, 634, correlation with solar activity, 1149, and solar radiation, 2985, world distribution of, 1379
irregularities in, (A)2799, effect on reflected waves, 2526, 2527
position of ionospheric equator in, 882
27-day variations of critical frequencies at Huancayo, 883
fluctuations in galactic radiation due to, 1634
ionization in, distribution between E and F layers, 354
and s.w. absorption in, effects of scale-height gradient on, 1644
variations of, and ground pressure, 2999
irregularities, 980
winds and turbulence, 2179
layers, thermal splitting of, 879
lower, experimental investigation of fine structure of, 1898
magneto-ionic multiple splitting calculated by phase-integration method, (A)2712
magneto-ionic triple splitting of waves in, 1147, 2427, 2714
observations, in Adélie Land, 112
in *Commandant Charcot*, 2997
at Dakar, 1148
properties of, and position of sun, 2809
reflection, of atmospherics, 2184, 2185
of h.f. waves during aurora, 1649
of very long e.m. waves, 1474
refractive index and wave propagation in, 3094
review for 1950 and forecast for 1951, 1903
soundings, l.f., by observation of atmospherics, (A)2263
with rapid-frequency-change equipment, 1900
sporadic-E layer, at Brisbane, 1899
movements in, on 13th June 1949, 2998, on 21st June 1949, 2426
night-time, statistics of, 1377
storm, and radio-circuit disturbance, 1470
15th March 1948, 889
20th–21st Feb. 1950, caused by aurora borealis, 1150

L

Laboratories, Bell Telephone, organization and scope of, 793
Lamps, discharge, hot-cathode, as modulated light source, 2867
Lenses, (See also Aerials, microwave; Electron lenses; Radiators)
microwave, 36, (D)2924
artificial dielectrics for, (A)2100, isotropic, (A)2100
delay, using array of conducting disks, 2923, German development of, 37
effect of periodic variation of field distribution across, 573
experimental prototype of Rinehart-Luneberg lens, (A)2100
metal, determination of constants of, 2351
metal-plate, research at A.F.C.R.L. on, (A)2642, wide-angle, (D)1078, (C)2652
theory of parallel-plate media for, 1571
for u.h.f. waves, 1842
ultrasonic, of plastic materials, 1292
Light, radiation pressure in refracting medium, 1606
beams, paraxial, energy-flow distribution in, 616
velocity of, measurement of, 324
proposed new value for, 1609
Lightning, electrical processes between strokes, 2182
protective devices, performance characteristics of, 998
upward discharges from thunderclouds, 2183
Limiters, impulse-noise, Ge-diode, 445
Loudspeakers, amplitude and phase measurements on cone diaphragm, (A)2062
cabinet design for, 809, 2897
cone, quality assessment of, 2093
damping of, and performance, 2626
theoretical and experimental study of, 2328
diaphragm vibrations of, recording of, 2143
direct-radiator type, effect of mounting on response of, (A)2062
excitation of subharmonics in, 2627
physical and electrical constants for, (A)2062
explosion-proof, 2899
for F.A.S. system, 804, 805, 1832
high-fidelity, 3-unit, 276
horn, catenoidal, resonance characteristics of, 7
response peaks in, 6
improved bass response in, (A)2062
nonlinear distortion in, 556
automatic analyser for, (A)1811, 1836
response improvement by means of motional feedback, 1835
sensitivity, directivity and linearity of, 275
transient reproduction by, 2896
transient testing of, 277, (A)2062
unidirectional systems of, 555
Luminescence efficiency of organic solutions and crystals, 1396

M

Magnetic field, of circular filaments and solenoids, formulae and tables for, 91
cosmic, origin of, 2969
and gravitation, 108, 1637
interstellar, strength of, 1891
lines of force made visible, 1348
of magnetic dipole outside semi-infinite conductor, 2155
measurement of, with Bi spirals, 1431
using 'peaking strips', 2766
and regulation by nuclear induction method, (A)2226
of plane circular loop, 856

  pulsed, production of, **922**
  of stars, and rotation, **107**
    and of interstellar space, origin of, **2173**
——**materials,** (See also Alloys; Ferromagnetic materials)
  boroferrites, thermomagnetic investigation of, **653**
  powders, properties at u.h.f., **372**
  production control of permeability of, **2233**
  thermal effects due to magnetization processes in, **914**
——**measurements,** c.r.o. unit for, **2477**
  of permeability and loss for straight samples, **156**
——**properties,** after-effect in powder cores, **2446**
  of finely dispersed substances, **2406**
  magnetic viscosity, dependence on temperature, **2410**
    laws of, **2409**
    of permalloy, **2734**
  of polycrystalline metals, effects of plastic deformation on, **1676**
——**resonance,** survey of, **2965**
——**suspensions,** oscillations of, **2153**
——**systems,** with permanent magnets, optimum parameters of, **2459**
Magnetism, effect of directed stresses on shape of magnetization curve, **2408**
  ferrimagnetism and antiferromagnetism, **2977**
Magneto-chemical effect, review of research on, **2964**
Magnetometer, airborne, for mapping total geomagnetic-field contours, **1442**
  oscillation-type, **1711**
  for weak fields, use of electron multiplier in, **2765**
Magneto-optics, of electron gas with guided microwaves, **2911**
Magnetophotophoresis, review of research on, **2964**
Magnetoresistance, of alloys, **3018**
  of Bi, at 3 kMc/s, **1165**
  of Bi fibres, **373**
  of silicon-iron, **1164**
Magnetostriction, constants for single crystals of Fe/Co alloy, **871**
  effects in transformers, **2313**
  of Fe/Pd and Ni/Pd alloys, **1935**
  of Fe/Pt alloys, **370**
  hysteresis, in alnico and vicalloy, **2733**
    in high-coercivity alloys, **1936**
  and morphic effects for Ni crystal, **3020**
  of prolate spheroids, **1873**
  reversal of sign by expansion, **916**
Magnets, with air-gaps, effect of leakage in, **1947**
  permanent, design of, **1171**
    stability of, **2213**
  ring-gap, measurements on, **943**
Manometer, diaphragm-type, for pressures 1–100 μ, **1438**
Mathematics, aleatory functions, stationary, Laplacian, **1691, 1692**
    in theory of background noise, **384**
  associated Legendre polynomials, approximations for, **1415**
  calculus, operational, Heaviside's, and Schwartz functions, **932,** techniques of, application of remainder theorem to, **677,** (C)**2219**
    symbolic, application of, **930**
  correlation analysis, (See also Analysis), **1179**
  correlation functions, and application in communication theory, **1180**
    of phase- and delay-modulated signals, **2536**
    and power spectra, **141**
  differential equations, nonlinear, generalized reversion formulae applied to, **2217**
    second-order, periodic solutions of, (D)**3036**
  eigenfunction problems for periodic potentials, **676**
  eigenvalue problems, natural, **1176**
    solution by factorization method, **2216**
  elliptic difference equations, random-walk procedure for, **1416**
  evaluation of $\int_c we^{-\lambda u}dv$ by saddle-point method, **2466**
  extension of Weyl's integral for harmonic spherical waves, **3034**
  finite representation of impulse functions, (A)**2218**
  Fourier analysis, method of discontinuities in, **2215**
  integrals in calculation of aerial-current distributions, **2917**
  Laplace transform, for determination of eigenvalues, **1178**
    inversion of, **383**
  linear differential and integral operators, iteration method for eigenvalues of, **1418**
  Mathieu's equation, stability of periodic solutions of, **1583**
  matrices, eigenvalues of, calculation by punched-card machines, **1175**
    positive definite, formation of, **2941**
  Maxwell's equation, asymptotic series solution of, (A)**2752**
  Mellin transform and applications, **931**
  minimized iterations and matrix eigenvalue problem, **2465**
  smoothing of experimental curves, **2753**
  spheroidal wave functions, characteristic values of, **382**
  Struve functions, and associated integrals, **140**
    extension of Lommel integrals to, **138**
    integrals of, **139**
  Schwartz-Christoffel transformation, generalized, basic theory of, **1951**
  Tchebycheff polynomials, zeros of, **137**
  vector wave equation, solution of, **3035**
Measurements, (See also individual subjects)
  of amplitude ratio and phase at v.h.f., **1962**
  application of communication theory to, **3041**
  electrical, N.B.S. standards for, **2227**
  equipment for, British developments in, **391**
    microwave, **946, 1966,** inductive probe, **3048**
    for voltage s.w.r. at 2·6–4 kMc/s, (A)**1958**
    for 30-cm band, review of, **2479**
  mm-λ, (A)**1958**
  at 0·3–4 kMc/s, with Type-874LB slotted line, **1714**
  at 28–300 kMc/s, (A)**1958**
Metallurgy, powder, and electrical contacts, **923**
Meteorology, (See also Radar applications)
  air-launched automatic weather station, **3070**
  radio techniques for, C.S.I.R.O. work on, **2421**
Meteors, deceleration and ionizing efficiency of, **1625**
  trail echoes, fluctuation of, **359**
    interpretation of, **1885**
    recording apparatus for, **1915, 3003**
  trail ionization and effect of wind, **339**
  velocity of, **100**
Meters, a.c., rectifier-type, with reduced waveform error, **687**
  d.c., log-scale, design of, **399**
Microphones, calibration using pulse technique, (A)**553**
  capacitor, sensitivity measurement by reactance-valve method, **2624**
  high-order-gradient, using single diaphragm, (A)**1811**
  laboratory-standard, American standard Z24.4-1949 for pressure calibration of, **19**
  second-order-gradient, with single diaphragm, **20**
  tube, **273**
  ultrasonic, effects of reflected signals and electric pickup in, **1824**
Microscope, (See also Electron microscope)
  flying-spot, **1738**
Microwave optics, aperture phase errors in, (A)**2642**
  diffraction effects in focal regions, (A)**2100**
  reflectivity of metal layers, **3092**
Microwaves, (See also Measurements; Wave propagation, e.m.)
  intense, biological effects of, **175**
Mixers, dm-λ, using diodes, sensitivity of, **2824**
  harmonics and intermodulation frequencies in, **2956**
Modulation, amplitude, theory of, limited-spectrum signals in, **2829**
  frequency, linearization of characteristic for large deviation, **496**
    nonlinear distortion in, **443, 2835**
    simplified calculations using a.m.-f.m. analogy, (A)**2270**
    wide-band, simple method for, **2857**
  measurement, at maximum-amplitude points, **1826**
  phase, distortion in, **449**
  phase-to-amplitude, for u.h.f. television transmitters, **477**
  polyphase, and telecommunication filter problems, **213**
  pulse-count, quantization distortion in, **1488**
  systems, and theory of communication, **2017**
  on waveguides, using magnetrons, **1012**
Modulators, frequency, low-distortion, (A)**2298**
    using transistor, **3147**
  magnetic, for amplification of small d.c. signals, **152,** (A)**682,** (A)**2122**
  pulse, h.v., for radar transmitters, **2431**
  using Type 1553-416A triode, **310**

Monitors, automatic, for broadcasting programmes, design of, **1491, 2280**
  for f.m. 30–175-Mc/s transmissions, **1972**
  modulation, Type ON301, used by Netherlands broadcasting stations, **1971**
  recording, for aircraft-to-ground speech signals, **207**
Moon, as reflector of 20-Mc/s signals, **2264**
Multivibrator, symmetrical, theory of, **2387**
  time-delay calculation for, **72**
Musical instruments, electronic, Baldwin organ, design of, **1210**
    organ using neon-tube generators, **1445**
    4-unit, **1737**

N

Navigation, aerial, blind, application of Liouville's approximation to, **900,** and Einstein's equivalence principle, **899**
——**aids,** (See also Radar)
  aerial, automatic G.C.A., **1658**
    automatic radio compass, **2190**
    beacons, omnirange, effect of vertical aerial with counterpoise on range of, (A)**2186**
    beacons and radio ranges in Britain, **2435**
    for civil aviation, development of, **897**
    Decca, automatic course plotter, **2192,** testing at high noise level, **3062**
    distance-measuring equipment, Australian, **1392,** for civil aircraft, **1659, 1918,** echo-interference suppression in, **3007,** i.c.w. system for, (A)**2186,** 100-channel, **2722**
    general survey of, **2434**
    loran, design of transmitter for, **2300,** training operators of, **3008**
    microwave d.f., **2189**
    phase-measurement methods, precautions against errors in, **3006,** source of error in, (D)**2433**
    shoran, for geodetic distance computation, **898**
    short-range, ρ-θ, **1158**
    survey of, **3005**
    at Zürich-Kloten airport, **3009**
  C.S.I.R.O. work on, **2421**
  marine, consol, for fishing fleet, **2188**
    Decca, **2188**
    presentation of information in, **2719**
    survey of, **2188**

——**systems,** aerial, hyperbolic, **1393**
    long-distance, and l.f. ionospheric radio-wave propagation, **1761**
    pulse, **362**

Networks, (See also Circuit theory; Filters; Impedance; Quadripoles)
  amplitude and phase response computation for, **1856**
  analysis of, flow graph technique in, (A)**2122**
  biconjugate, theory of, **2939**
  bridged-T, as frequency-determining element, **2943**
  compensation, 2-pole, **61**
  compensation theorem, application to radiation and propagation problems, (A)**2648**
  coupled, circle diagrams in analysis of, **2665**
  definitions of terms in network topology, 50 IRE 4.S1 standard on, **1322**
  equivalent, for negative-grid triodes, **1321**
  generalized matrix theory of, **837**
  h.f., response of, analysis by l.f.-equivalent method, **2664**
  hydraulic, electrical equivalent of, **1855**
  impedance, quadripole, effect of losses on attenuation in, **1110**
    synthesis of, with loss distribution in reactors, **1109,** without transformers, **1108**
  Kirchhoff, synthesis by determination of purely reactive networks, **593**
  ladder, algebra for solution of, **1588**
    resistance-reactance, response characteristics of, **2374**
  linear, mathematical study of equivalence of, (A)**2122**
    variable, with one reactance, approach to steady state of, **588,** spectrum produced by, **2373**
    varying-parameter, analysis of, **834,** band-pass low-pass transformation in, **591,** constant-resistance, (A)**2122, 2667,** correlation functions and power spectra of, **586,** influence of initial conditions in, **2668,** stability of, **2124**
  load-compensation, for amplifiers, **304**
  passive, linear, distortion of f.m. signal in, **2676**
  phase-shifting, single-frequency, design of, **302**
  phase-splitting, wide-band, properties of, (D)**2123**
  pulse testing of, **2235**
  quadripole, active, transients in, **2944**
    double-T, between finite resistors, properties of, **1589**
    linear, passive, conductance diagrams for, **1324**
  RC, applied to transfer ratio synthesis, (A)**2122**
    for generation, amplification or rejection of alternating voltages, **1106**

    passive, synthesis of, **2940**
    synthesis of, (D)**1102, 2371**
  representation by superposed balanced circuits, **2671**
  synthesis of, application to feedback control, (A)**2122**
    operational calculus for, (A)**2122**
    potential analogue method for, **2370**
  theory, **2942**
    application to probability problems, (A)**2122**
    extension to biological field, (A)**2245**
    extension of Thévenin's theorem, **297**
    positive definite matrices in, **2941**
  with varying parameters, oscillations in, **595**
  wide-band, 2-phase, (D)**56,** computation of, **1103,** theory of, **1104**
  2-terminal, application of equalizer curves to design of, **2372**
    impedance functions of, (A)**2125**
  2*n*-terminal, finite, synthesis of, **65**
    passive, synthesis of, **64**
    synthesis of, **2128**
    theory and application of, **305**

Night sky spectrum from 6800 to 9000 Å, **1386**
Noise, (See also Cosmic radiation, r.f.; Fluctuations; Generators, noise; Solar noise)
  acoustic, background, in attenuating fluid medium, **2311**
    complex, with continuous spectrum, definition of, **799**
  background, aleatory functions in theory of, **384**
    in amplifiers, **1333**
    in transistors, **779**
  contact, in semiconductors, theory of, **910**
  crackle eliminators of German P.T.T. using Se rectifiers, **838**
  in electron beam, due to velocity fluctuation, **1038**
    space-charge and transit-time reduction of, **1274**
  factor, direct-reading u.h.f. meter for, **3043**
    of receiver, effect of circuit losses on, **3101,** survey of, **2532**
  figure, N.B.S. standards, **1729,** (A)**2226**
  in h.f. gas discharge in steady magnetic field, **614**
  integration, reduction in radar reception, **360**
  Johnson, energy distribution in, **50**
  microwave, from zenith, **1367**
  in oscillatory circuits, limiting of, **2960**
  random, in dielectric materials, **1689**
  resistor, measurement of, **945**
    in photoconductive cells, **2861**
  r.f., in d.c. gas discharge, **2974**
  in semiconductor rectifiers, **909, 1408**
  shot and Johnson, theory of, **2135**
  shot and thermal, identity of, **292,** (D)**293**
  in television receivers, abacs for calculation of, **3142**
  thermal, in linear circuits, calculation of, **2396**
  valve, limitation of operation of d.c. amplifiers by, **2879**
    produced by heater-to-cathode currents, **2877**
  valve-grid, induced, **2878,** and noise factor, **1535**

Nomogram, (See also Abacs)
  and slide-rule, for spherical-triangle problems in radio communications, **2754**

O

Observatory, Kiruna, for ionospheric and radio-propagation observations, **1380**
Optical systems, Schmidt, **82**
Optics, reflection reduction in, **81**
Oscillations, e.m., excitation of, theory of, **2415**
  forced, in circuits with iron-cored coils, **66**
    due to step and needle impulses, Fourier spectrum of, **68**
    in nonlinear systems, **1417**
    in quasilinear systems, **1177**
  free, of dielectric rings, **1353**
  nonharmonic, in circuits including saturated inductors, **67**
  in nonhomogeneous discrete structures, **2399**
  nonlinear, differential equation occurring in theory of, **1693**
    solution of Mathieu's equation for, **2951**
    topological methods for investigation of, **1851**
  in nonlinear systems, theory of stability of, (A)**2122**
  parametric excitation of, **1338**
  relaxation, amplitude limits for, **1852**
    new method for study of, **1872**
  relaxation and pendular, theory of, **2131**
  subharmonic, conditions for excitation of, **2627**
    in nonlinear circuits, input-phase effect on, **2673**
Oscillators, a.f., bridge-stabilized, for tuning musical instruments, **693**
  comparative survey of, **2675**
  crystal, measurement of equivalent-circuit constants of, (A)**1958**
    variable-frequency, ultrasonic, (A)**525, 1552**
  for cyclotrons, design of, **1981**
  dm-λ, using grounded-grid disk-seal valves, **1280**
  feedback, analysis of, **1860**
  frequency drift of, measurement of, **2484**
  frequency stabilization of, **1118**
  high-stability, for 2–4 Mc/s, **2819**
  linear, mathematical theory of synchronization of, **1583**
  mechanically tuned, a.f.c. of, **601**
  phase-shift, **598**
    determinantal solution for, **1597**
    oscillation generation in, **842**
  quartz-crystal, overtone, for 33–55 Mc/s, **2382**
    surface vibration patterns of, (A)**558**
  RC, feedback, Π-coupled, **309**
    sine-wave, **2955**
    test, for 20 c/s–200 kc/s, **2237**
    Wien bridge as phase-shift element in, **597**
  reactance-valve, (D)**71**
  r.f., of synchrocyclotron, pulser for, **2255**
  self-blocking, and applications, **1116**
  simultaneous excitation of two different frequencies in, (A)**2122**
  stabilized, by gas absorption lines, (A)**1958**
    for multichannel communication, **1117**
  s.w., self-excited, **844**
  sweep, 2·6–3·4 kMc/s, **414**
    3·6–4·5 kMc/s, **413**
  test, for crystal resonators, development of, **1437**
  theory of, and random noise, (A)**2122**
  transistor, graphical analysis for, **1101**
  300–4000 kc/s, with saturable-reactor tuning, **1332**

P

Particle accelerators, betatron, ejection of electron beam from, **961**
  betatron and synchrotron, magnet models for, field measurements on, **699**
    resonance damping at injection in, **1448**
  bevatron, magnet design for, (A)**179**
  cyclic, **2789**
  cyclotron, design of oscillators for, **1981**
    f.m., beam oscillations in, **1214**
    Stockholm, acceleration chamber and dees for, **2254**
  cyclotron and synchrocyclotron, **1449**
  direction and phase problems in, **1447**
  electron, linear, 10^9eV, (A)**2245**
  electronic ram, **2788**
  gas scattering in, **1446**
  linear, review of, **180**
    4–5 MeV, preliminary experiments on, **1738**
  neutron generator, 200-kV, at Uppsala, **2251, 2252**
  synchrocyclotron, air-cored, for 400-MeV protons, **1982**
    at Amsterdam, **422, 2790**
    at Carnegie Institute of Technology, timing unit and pulse deflector generator for, (A)**2245**
    at McGill University, pulser for, **2255**
    400-MeV, for Liverpool University, **2253**
  synchrotron, electron, design of, **1212**
    proton, at Birmingham University, **700**
    resonance oscillations in, **962**
    30-MeV, design and operation of, **1213**
    300-MeV M.I.T. model, **2499**
  travelling-wave, **1017**
  using Van de Graaff e.s. generators, **421**
Particles, fundamental, masses of, **97**
Permeability measurement, for straight samples, **156**
Permeameter, absolute, for magnetizing forces up to 300 oersted, **157**
Perturbations, of limited duration, method for study of, **2136**
Phase angle, c.r.o. display of, **1719**
  control, with constant attenuation, **299**
  inverter, choke-coupled, high-accuracy, **1580**
  measurement, addition circuit for, **1724**
    direct, **3058**
  meter, a.f., precision, **409**
    l.f., precision calibrator for, **2770**
Phosphors, KBr and LiF, decay of luminescence of, **904**
  luminescence spectra under X-ray and c.r. irradiation, **366**
  and phosphorescence, survey of, **123**
  and photoconductors, properties in intense electric fields, **902**
  sulphide, theory of luminescence of, **646**
  ZnS, luminescence and trapping in, **649**
  ZnS-Cu, **124**
    efficiency of, temperature variation of, **1664**
    emission and trapping in, effect of infrared on, **648**
    quenching action of long-wave radiation from, **1607, 1608**
    state of oxidation and luminescence colour of, **645**
  Zn_2SiO_4-Mn, cathodoluminescence of, **1921**
    emission spectra of, **367**
    'sub-bands' in luminescence spectrum of, **647**
Photocell applications, in colorimetry, **2248**
    servo control for solar telescopes, **2779**
    thyratron-operated baseball umpire, **1211**
  argon-filled, effect of magnetic field on characteristics of, **2040**
  electron-multiplier, German developments in, **2041**
    for photon counting, **2509**
    in scintillation counters, **1016**
    survey of, **2868**
    time dependence of sensitivity of, **3155**
  Ge p-n junction as, **2302**
  PbS, characteristics of, **2862**
    photoconductive, sensitivity and response time of, **3157**
  photovoltaic, effect of electron bombardment on, **2303**
  resistance, CdS, applications of, **2860,** preparation of, **2724**
    operating limits of, **2861**
  Se, characteristics of, **1513**
    spectral sensitivity of, **769, 3158**
  Tl_2S, photoconductivity of, **2043**
  trigger, Ge, **3154**
Photoconductivity, of composite conductors, theory of, **84**
  of Cs-Sb films, **2723**
  infrared, of valence intermetallic compounds, **2042**
  of Mg_3Sb_2 layers, **1163**
  of PbS, long-period effects in, **3156**
  of various elements, **3149**
Photoconductors, refractive index and infrared sensitivity threshold of, **1273**

Photoelectric effect, in alkali/germanium compounds, **364**
for Cs-O, Cs-S, Cs-Se and Cs-Te photocathodes, **1797**
in Cu_2O and CuO, **2859**
in oxide cathodes, **1027**
surface, in ferromagnetic materials, **2401**
theory of, **607**
——**emission**, from BaO, enhanced, **1663**
from BaO and SrO, enhanced, **365**
from Cs-Sb films, mechanism of, **643**
from Na and K, **1662**
properties of complex layers, **1272**
Photography, high-speed, iconoscope electro-optical shutter for, **1223**
image-converter tube for, **2250, 3080**
Kerr-cell shutter for, **235**
tone rendering in, **758**
Photophoresis, review of research on, **2964**
Physics, fundamental and derived magnitudes in, **2976**
Pickups, arm damping for, **(A)2082**
feedback-controlled calibrator for, **(A)1811**
Piezoelectric constants, (See also Piezoelectric crystals)
and associated constants, matrices of, **(A)610**
of ZnS, **1924**
——**crystals**, (See also Quartz)
ADP, EDT and quartz, growing of, **920**
amplitude of vibration of, **2383**
EDT, elastic and piezoelectric constants of, **128**
elasticity of, **1683**
equations of state for, **98, 99**
in flexural vibration, equivalent circuits for, **2952**
and in thickness-shear vibration, **1861**
isometric and tetragonal, h.f. vibrations of, **69**
low-loss systems, **1551**
square plates, determination of coefficients for, **2208**
Plasma, in crossed fields, fundamental equations for, **2150**
electron interactions in, **2975**
e.m. oscillations, **853**
in low-pressure Hg discharge, **2875**
in static magnetic field, **2151**
in magnetic field, properties of, **2989**
moving, e.m. waves in, **717**
Polarimeter, for 150-kc/s echoes from ionosphere, **415**
Potential, contact, of irradiated metal-oxide surfaces, **80**
problems of, dual integral equations in, **1614**
vector, method for mapping distribution of, **1428**
Potentiometer, a.c., synchropotentiometer, polar ammeter as, **162**
recording, automatic, high-sensitivity, **1969**
for 1–10^6 μV at frequencies up to 1 kMc/s, **1712**
Power measurement, h.f., with bolometer bridge Type 1651-A, **410**, wide-band bolometers for, **(A)1958**
low-level, by combining unmodulated and modulated signals, **(A)2226**
microwave, **397**, absolute, **(A)1958, 2771**
for 3-cm and 10-cm waves, **168**
spectra, and autocorrelation functions, **141**
supplies, constant-current, for electron-microscope lenses, **746**
emergency, for microwave relay systems, **234**
h.v., for e.s. c.r. tube, from r.f. oscillator, **1785**
for television receivers, **(A)2284**
for transmitters, **2550**
vibrator, performance tests for, **1702**
voltage-doubler, with saturable reactor, **1001**
Probability distributions, of resultants of two or more vibrations, **(A)678**
first-passage-time problem, **1127, 1694**
quantum calculus of, **604**
Pulses, definitions of terms for, 51 IRE 20S1 standard on, **2826**
diffraction and reflection by wedges and corners, **2963**
lengthening circuits for, **2655**
microwave, generation and shaping of, **3111**
nearly periodic, energy spectrum of, **(D)441**
sharpening circuits for, **2375**
transformation from and to sinusoidal waveform, **2927**

Q

Q measurement, inflection-point method for v.h.f., **(A)1958**
multiplier, high-stability, **2678**
Quadripoles, (See also Networks)
passive, as coupling for tuned circuits, **2945**
'gyrator', parameters of, **301**
with specified parameters, synthesis of, **57**
theory of, application to waveguides, **814**
Quartz, α- and β-, piezoelectric constants at various temperatures, **650**
crystals, equivalent-circuit constants of, measurement of, **392**
large, growing of, **3024**
measurement of oscillation amplitude of, **2774**
overtone, for oscillators, **2382**
for radio equipment, production of, **1938**
X-cut, equivalent circuit for, **561**, free from harmonics, **1169**, Straubel, sound field of, **5**
zero-temperature-coefficient, **2452**
piezoelectric constants of, temperature coefficients of, **921**
plates, interferometric studies of vibration of, **1939**
production of, cutting-angle control in, **663, 664**, lapping and final frequency adjustment, **1940**
resonators, temperature dependence of, **2741**

R

Radar, (See also Navigation aids)
airborne, for observation of precipitation, **892**
application to geodetic surveying, **1154**
clutter reduction with logarithmic receiver, **3096**
Decca Type-I, for harbour control, **1912**
development in French navy, **2187**
dummy reflecting objects, German use of, **358**
echo boxes, optimum operation of, **2720**
echo from lightning, **1657**
echoes from clear sky, **2711**
echoes from meteor trails, interpretation of, **1885**
recorder for, **3003**
echoes from rain, **(D)1155**
and rain distribution in showers, **1385**
and mechanism of rain formation, **1648**
reduction by circular polarization, **(A)2186**
echoing areas of conducting bodies, **(A)2186**
integration-noise reducer for, **360**
marine, adverse effects of weather on, **1228**
developments in, **1391**
Marconi Radiolocator IV, **361**
Model TB-140 ramark beacon, **1916**
Radiolocator equipment for, **1911**
port facilities at Sunderland, **1388**
p.p.i. displays, graphechon tubes for, **3182**
pulse modulators for, **2431**
radio developments leading to, **639**
range, application of noise statistics to prediction of, **1390**
theory of, **395**
systems, analysis of, new basis for, **357**
automatic-tracking, angular jitter in, **1389**
resolution in, **3002**
visibility of echoes in, **1658**
Radiation, (See also Aerials)
e.m., from circular current sheets, **31**
from fast particles in magnetic field, consequences of, **1346**
from line source, effect of grounded dielectric slab on, **2106**
from magnetic dipole in spherically symmetrical stratified medium, **2800**
nuclear, ion chambers and ion-chamber instruments for, **2258**
r.f., in ionized gas, and solar radiation, **95**
Radiators, (See also Aerials; Lenses)
horn, theory of, **2962**
microwave, virtual, **(A)2100**
slot, effect of periodic variation of field distribution across, **573**
Radio, B.B.C. research on, **2881**
communication station, Burnham, Somerset, **452**
equipment, Service, relation between production, operation and maintenance of, **(AD)1539**
progress during 1950, **2604**
research, by Telefunken, 1939–1945, **2882**
systems, using periodic signals, design of, **736**
——**links**, (See also Communication systems; Radiotelephony; Relay systems; Television)
Afourer/Bin-el-Ouidane, passive relays for, **220**
design of radiotelegraph receiving system for, **2822**
dm-λ, planning of, **1245**
international possibilities of, **218**
microwave, for Bonneville Power Station, **1777**
multiplex, field tests of, **1243**
polarity diplexing in, **3113**
for power-system applications, **217**
problems of, **(A)216**
Tasmania/mainland, propagation measurements for, **1759**
teleprinter, with automatic fault correction, **2837**
u.h.f., for Spain, **2836**
v.h.f. and u.h.f., in Australian P.O. network, **1778**
Radioactivity, measurement instruments for, **3079**
Radiosonde, code-transmitting, **2243**
international trials, May 1950, at Payerne, **697**
Radiotelegraphy, network in N.W. Western Australia, **1772**
overseas, equipment at Frankfurt a. M., **446**
4/2-channel time-division multiplex system, **3108**
Radiotelephony, (See also Communication systems; Radio links)
automatic calling device for, **2015**
control-terminal equipment for, **1773**
directional-transmission tests in Alps, **219**
mobile, proposed services for Australia, **1774**
urban, 6-channel system with 60-kc/s spacing, **741**
U.S. highway system, study of, **2279**
v.h.f., ship/shore system for Liverpool harbour, **221**
multichannel, v.h.f., application of f.m. to, **(D)1241**
new London terminal for, **2539**
overseas, equipment at Frankfurt a. M., **446**
u.s.w., Telefunken post-war developments, **2538**
Rain, origin of electric charge on, **2429**
scattering of 10-cm radio waves by, **1385**
Reactance and inductance, measurement with double potential divider, **[illegible]**
Reactors, saturable, characteristics of, **1315**
with resistive load, response of, **(A)2932**
Receivers, (See also Television)
adjacent-channel-rejection, for mobile systems, **1480**
amateur, for c.w., a.m., f.m., p.m., and s.s.b. with carrier suppression, **439**
broadcasting, high-fidelity, a.f. amplifier stage for, **440**, h.f. circuits and power supply for, **982**, cathode-coupled frequency changer for, **2817**
printed-circuit techniques in manufacture of, **(A)2292**
speech silencer unit for, **(A)2265**
Telefunken, post-war, **2530**
Type T.R. 153, using cathamplifier circuit, **2818**
communication, design of, **2004**
dual-diversity frequency-shift, **2823**
Telefunken, post-war, **2529**
f.m., detector circuits for, **1479**
measurement of spurious radiation from, 51 IRE 17S1 standard on, **3099**
u.s.w., commercial, **2821**, démodulation in, **2820**
for 88–108 Mc/s band, **731**
high-sensitivity, for cosmic noise, calibration of, **2487**
logarithmic, successive-detection, **3096**
performance tests on, **1727**
pulse, comparison of amplifier circuits for, **1866**
s.s.b., a.f.c. for, **2003**
for R/T, **2266**
subminiature, radio-range, **3097**
190–550 kc/s, **(A)2265**
Reception, (See also Field strength; Television, Wave propagation, e.m.)
diversity, comparison of systems for, **2267**
for facsimile, comparison of systems for, **3124**
for 7–16 Mc/s, performance of different systems, **2268**
of periodic signals in noise, application of correlation analysis to, **780**
and rectification, of signals in presence of noise, **3098**
of repetitive signals in noise by cross-correlation, **(A)2265**
signal/noise improvement by integration, **732**
spaced-aerial, of ionospheric waves, diversity effects in, **1232**
of 450-Mc/s and 150-Mc/s R/T transmissions by mobile receiver in New York, **734, 1766**
Recorders, (See also Sound recorders)
field-strength and wave-direction, for λ 3·2 cm, **2523**
ionosphere, automatic, for range 0·55–17 Mc/s, **1191**
panoramic, for range 1–20 Mc/s, **1425**
0–20-Mc/s, **(D)1192**
magnetic-tape, for 1–100-c/s electrical signals, **970**
for μs-pulse amplitudes, **402**
monitoring, for aircraft-to-ground speech signals, **207**
range-adjusting, for radiosonde, **176**
for rate drift of timepieces, **938**
Recording techniques, photographic, for c.r.o., **675**, speed of, **2768**
Rectification, and reception, of signals in presence of noise, **3098**
Rectifiers, (See also Transistors; Valves, crystal)
Al-Al_2O_3-electrolyte, properties of, **1254, 2286**
barrier-layer, back current in, **374**
formed by welding two metals, **2729**
heterogeneous, theory of, **2744**
temperature dependence of barrier height in, **3153**
theory of, **3026**
with buffer capacitors, calculation of, **994**
contact, thermal instability of, **2212**
crystal, with heavy d.c. bias, impedance of, **1532**
crystal-diode, theory of, **2677**
Cu_2O, conductivity contour of barrier layer in, **997**
dielectric properties of, **925**
Cu_2O and Se, review of, **3119**
disk, characteristics of, **2840**
measurement of capacitance of, **940, 941**
dry, nonuniform distributions of impurity centres in, **924**
Ge, effect of composition of contact point on, **1942**
n-type, hole concentration in and point-contact characteristics of, **376**, point-contact, inverse-voltage characteristic of, **1530, 1531**
p-n junction, **2302**, preparation by impurity diffusion, **378**, theory and experiment for, **1669**
point-contact, electron-bombardment-induced conductivity in, **1685**
Ge-diode, current decay in, **1528**
h.v. reverse current of, **1529**
manufacture and properties of, **2059**
high-power, new types of, **225**
Se, capacitance of, **744, (D)1250**
electrical forming effects in, **926, (D)1943**
as limiters in crackle eliminators, **838**
origin of time-lag effect in, **1686**
Tl-containing, forming processes in, **1170**
theory of d.c. characteristics of, **2743**
Reflection, (See also Sound; Wave propagation, e.m.; Waves)
of e.m. waves at discontinuity of permittivity or permittivity gradient, **723**
nonspecular, by surfaces with bosses, **2692**
of pulses, by wedges and corners, **2963**
of 30-cm waves from Hg-arc discharge, **1618**
Reflectors. See Aerials, microwave.
Regulators, voltage, stability of, **(A)1251**
Relay systems, (See also Communication systems; Radio links; Radiotelephony; Television)
f.m., multichannel, distortion in, **1489**
microwave, **215**
TD-2, New York/Chicago, **450**
travelling-wave amplifier as repeater for, **(A)2270**
wide-band, long-distance, measurement techniques for, **(A)1958**
Repeaters, negative-impedance, **1770**
portable, for B.B.C. outside broadcasts, **2881**
Research, in Metropolitan-Vickers laboratories, 1950, **2075**
Resistance, of metal plate with internal electrode, **2142**
of Pt foil, variation due to gas adsorption, **125**
of single crystals of tin at 9·4 kMc/s, **329**
standards, h.f., for calibration of admittance bridge up to 60 Mc/s, **601**
Resistivity, a.c., of ground, determination of, theory of, **1193**
Resistors, borocarbon, **583**
carbon and borocarbon, production and properties of, **2365**
printed, quality of, **1584**
SiC, in series with impedance, **2657**
wire-cage type, for h.f. measurements, **2759**
Resonators, acoustic, apertured-panel type, absorption by, **2325**
apertured-plate, impedance of, **2321**
damping of, **2067**
with elastic walls, oscillations in, **300, 1293**
spherical, calculation of λ for, **2320**
cavity, coupled, oscillations in, theory of, **1115**
cylindrical, with d.c. discharge, **1595**
effect of introducing dielectric ring into, **1862**
e.m. oscillations in, approximate calculation of, **1594**, theory of, **2953**
as interstage transformers, **308**
perturbation effects in, **70**
Π-type, calculation of, **2385**, design of, **2386**
piston-type, for m and dm λ, **2954**
crystal, (See also Quartz resonators)
measurement of electrical characteristics of, **1704**
e.m., phenomena near natural frequency of, **1863**

S

Screening, e.m., **458**
Seals, glass, butt and graded, theory of stresses in, **3032**
glass/metal, Ni-Cr-Fe alloy for, **674**
physics of, **135, 929, 1173, 2461**
metal/ceramic, using Mn/Mo mixture, **1410**
properties of interface, **(A)2194**
mica/glass and mica/alloy, **2462**
quartz/Mo, for high-temperature lamps, **381**
Semiconductors, adsorption of gases on, **1667**
aggregation of trapping centres in, **1926**
asymmetrically illuminated, rectification in, **3013**
bornite, characteristics of, **1930**
CdO, electrical properties of, **2200**
Hall constant of, **1678**
CdS, dependence of electrical properties on electrode arrangement, **1188**
conduction phenomena in, **2726**
contact noise in, theory of, **910**
controlled-valency, **905**
and dielectrics, modern theories on, **375**
energy gap in, temperature dependence of, **3016**
excess, parameters of, **3014**
Fermi levels in, **906**
Fermi limiting energy of, **1876**
Ge, effect of heat treatment on electrical properties of, **2201**
electron mobility in, **662**, in strong electric fields, **1398**
magnetoresistance at 20°–300°K, **661**
mobility and life of injected holes and electrons in, **1928**
n-type, conductivity changes due to α-particle bombardment, **1162**, hole diffusion in, **1668**
p-type, high-resistivity, properties of, **660**
preparation and properties of, **1681**
pressure dependence of resistance of, **1161**
production of single crystals containing *p-n* junctions, **1682**
thin layers, electrical properties of, **3021**
grey tin, electrical properties of, **2199, 2438**
Hall coefficient for, **1357, (D)2206**
impurity, Fermi level in, **1343**
impurity-band conduction in, mechanism of, **907**
lattice-imperfection phenomena in, **2197**
magnetoresistance of, theory of, **612**
measurement of impurity content of, **1927**
with mixed conductivity, diffusion of current carriers in, **2440**
mixed-crystal, properties of, **2727**
n and *p* types, contact theory for, **2745**
polycrystalline, dielectric dispersion in, **2196**
research at National Bureau of Standards, **1666**
resistance of, effect of lattice irregularities on, **911**
effect of pressure on, **2439**
resistivities in, combination of, **3015**
SiC, physical properties below 1000°C, **1680**
statistical fluctuations in, **909**
theory of flow of electrons and holes in, **377**
Servomechanisms, (See also Control systems)
carrier compensation for, **993**
compensation of zero-drift errors in, **1867**
contactor, analysis by frequency-response methods, **224**
critical gain of, determination of, **2021**
crystal-controlled, for control of rotating drum, **2020**
with linearly varying elements, stability of, **(A)2547**
network synthesis applied to, **(A)2122**
relay, analysis of, **992**
theory of, **743**
shunt motor, with inertia load, **1249**
steady-state and transient performance of, **222**
test methods for, **457**
Signal generators, (See also Test equipment)
for television testing, **1202**
terminal voltage of, **411**
variable-phase, **(A)2226**
0–30 Mc/s, **(A)2229**
Signal/noise ratio, for periodic systems, and cross-correlation, **(A)2265**
Signals, f.m., theory for spectrum analysis of, **2834**
phase- and delay-modulated, correlation functions and spectra of, **2536**
random, with limited spectra, theory of, **3166**
resolution into $\cos^2$ components, **2933**
Skin effect, and current distribution in conductors at h.f., **1613**
laminated conductors for reduction of, **2906**
Slide rule, and nomogram, for spherical-triangle problems in radio communication, **2754**
Snow and rain, radioactivity of, **893**
Solar activity, and geomagnetic activity, **2963**
and geomagnetic storms, 1950, **1631**
index, ionospheric, calculations of, **884**
influence on cosmic-ray intensity, **1362**
physical significance of character figures, **862**
Jan.–June 1950, **106**
——**atmosphere**, and origin of r.f. radiation, **341**
r.f. data on, **625**
——**constant**, **102**
——**corona**, e.m. radiation from, location of source of, **1628**
——**flares**, corpuscular streams from, **1888**
possibility of observation of, **1889**
geomagnetic effects of, **2968**
ionospheric effects of, **1381**
19th Nov. 1949, effects of, **885, 1143**
——**radiation**, and F_2-layer ionization, **2985**
r.f., **103**
correlation with cosmic rays, **1142, 2166, 2424**
dm-λ, from quiet sun, long-period change in, **2171**
during eclipse, Sept. 1950, **1633**
fluctuations of, **1358**, explanation of, **1359**, mechanism of, **1360**
m-λ, enhanced, **2170**, high-intensity, spectrum of, **1689, 1690**, spectra of 'isolated bursts', **2169**
and motion of material in the solar atmosphere, **2167**
from quiet sun, **344**
reflected by moon, **826**
and r.f. radiation in ionized gas, **95**

source points of, and solar flare, 2986
and sun's general magnetic field, 860
from sunspot of 14th June 1950, 2700
survey, 104, 1627, 2422
two large disturbances in Feb. 1950, 2168
at 81·5 Mc/s, distribution across solar disk, 2987
at 156 and 164 Mc/s, 627
at 1200, 600 and 200 Mc/s, (C)861
at 3·3 kMc/s, 2984
at 1·25 cm λ, 342
at 3·18 cm λ, 343
at 10 cm λ, during eclipse on 1st Nov. 1948, 347
at 50 cm λ, during eclipse on 1st Nov. 1948, 346
ultraviolet, from chromosphere, 1632
Soldering, and solders, recent advances in, 1172
ultrasonic equipment for Al, 1732
Sound, (See also Absorption; Acoustics; Diffraction; Reflection; Wave propagation; Waves)
attenuation, in water containing air bubbles, (A)1811
of higher-order modes in acoustic waveguides, 2615
diffraction of plane wave by paraboloid of revolution, 1047
distribution systems, cables for, 2905
fields, automatic plotter for, (A)519
automatic regulator for strength of, 2628
criteria for randomness of, (A)547
first- and second-order, with viscosity and relaxation, (A)1811
near focus of parabolic reflector, 2315
intense, sonic wind and static pressure in, (A)518
of oscillating disk, 4
of piston, analysis of, 2312
of pulse in semi-infinite duct, 268
radiated and diffracted by plane obstacles, relation between, (A)1811
wave-front plotter for, (A)517, 1547
high-intensity, effects in ear, (A)537
loudness of, calculation and measurement of, (A)542, 2324
measurements, and analysis, equipment for, (A)1811
anechoic chamber for, 2088
pressure measurement at high frequency, 1555
propagation, and atmospheric turbulence, 267
over great distances, 1542
in ocean, and surface sound-velocity gradient, 1044
radiation, in public-address systems, 2890
from semicircular disk, 138
ranging, for determining torpedo trajectories, (A)116
reflection, nonspecular, from absorbent surfaces, (A)1811, from planes with absorbent bosses, 2316, from planes with non-absorbent bosses, 9
of spherical wave from infinite plane, 2318
reinforcement systems, Church House, Westminster, 1828
comparison of arrays and distributed systems, 1829
recent developments in, 1294
scattering, and absorption, by soundproofing strip, 2314
by layers in the sea, 2083
by nonabsorbing sphere, 2317
by solid cylinders and spheres, (A)522, 2611
sources, line, synthesis of directivity pattern for, (A)1811
piston, high-frequency, theory of, 1546, velocity potential of, (A)521, 1815, 1816, (C)2610, vibrating freely or in finite wall, radiation field of, 1817
transmission, in granular materials, parameters for, 16
through partitions, 2616
through plate at oblique incidence, 1046
through walls at oblique incidence, (A)1811
velocity, in He, 515
in sea water, (A)514, 1814
waves, plane progressive, nonlinear interaction with small sphere, (A)1811
space pattern of, photographic method for displaying, (A)1811
——**recorders,** disk, square-wave testing of, (A)551
magnetic, ferrite recording heads for, 2445
for motion pictures, 2629
R.C.A. Type RT-11A, 2094
survey and applications of, 1560
Type MI-10794 head for, 807
and reproducers, British, 1559
——**recording,** disk, microgroove, optimum speed for, 2329
stylus sharpening process for, 2903
film, c.r. tube arrangement for, 1838
magnetic, 811
with a.c. bias, 1837
a.c. erasing heads for, 2630
accidental printing in, 810
developments in Great Britain, 1065
for motion pictures, 2901, in Germany, 2631
——**records,** disk, constant-frequency, calibration of, 533
——**reproducers,** disk, square-wave testing of, (A)551
magnetic tapes for, tests on, 557
and recorders, British, 1559
——**reproduction,** bass tone control in, 2090
disk, stylus/groove relations in, (A)550.
thorn needles in, 806, (D)1831, (D)2069
'expressor' system for music, 17
F.A.S. system, 805, 804, 1832
intensity level and listeners' tonal-range preferences, (A)536, 2891
magnetic, speed control of, 2900
Type MI-10794 head for, 807
stereophonic, broadcasting experiments on, 1061
in broadcasting of music, 1060
Space charge, (See also Valves)
congruent flow of, 1275
and phase focusing of electron beams, (D)3187
Spectrometers, radio. See Analysers, frequency-spectrum.
Spectroscopy, microwave, and applications, (A)1958
survey of, 2161
Speech analyser and synthesiser, (A)539
analysis, by phoneme detector, 2620
communication, and information theory, (A)737
intelligibility, effect of delay distortion on, 2323
power density spectrum, 1179
recorder, steno-sonograph, 271
sounds, autocorrelation analysis of, (A)541, 1056
circuit analogue for production of, 1058
frequency compression and expansion of, 1067
statistical properties of, (A)540, 1827
system-function analysis of, 1059
visible, reproduction of, 1057
waves, quantized, intelligibility of, (A)538
Stability criteria, Nyquist and Routh-Hurwitz, 580
relation of Nyquist diagram to pole-zero plots, 1086, (D)2358
criterion, 1312
of linear varying-parameter systems, theory of, 2124
mathematical study of, 579
Stabilization, (See also Frequency stabilization)
of a.c.-mains-fed d.c. amplifier, 2777
amplitude, of oscillator by nonlinear networks, (A)2122
of f.m. oscillator by crystal discriminator, 3145
frequency, by cm-wave oscillator, 1596, 2758
for measurements of microwave refractive index of gases, (A)2226
by modulation cancellation method, (A)2298
of oscillators, 1118
of high voltages, by corona discharge, 2548
of microwave oscillator with NH_3 absorption line, (A)1958
Stabilizers, alternating-voltage, low-power, 1492
precision, 227, 1253
voltage, cathode-follower, 231
for G-M counters, 228
moving-coil, high-sensitivity, 230
principles and performance of, 229
using two valves in parallel, 1252
Standard frequency, (See also Frequency)
coverage of station WWVH, 1190
methods used in Hawaii for comparison of WWV and WWVH frequencies, 2225
WWV transmissions, reception in Switzerland, 1476
Standards, (See also individual subjects)
frequency and time, atomic, survey of, (A)1958
in radio engineering, review of, 1809
51 IRE 21S1, on abbreviations of radio and electronic terms, 2605
Statistics, application in research and development, 1040
of correlated events, 933
Sun, derivation of model chromosphere from radio data, 345
magnetic field of, effect of turbulence on, 101
spectral investigations of, 1141
Sunspot cycle, predictions for, 2701
Sunspots, circularly polarized waves in, Bailey's theory of, 624
mean areas and heliographic latitudes for 1945, 1886
propagation of e.m. field of, 2423
provisional numbers, Oct.–Dec. 1949, 1361, April–June 1950, 628, July–Sept. 1950, 864, Oct.–Dec. 1950, 1887, Jan.–March 1951, 2702
relative numbers, correlation with F_2-layer ionization, 1149
survey of current theories, 863
Superconductors, Sn, penetration of magnetic field into, 330
Switches, electronic, circuits for, 2935
gas-filled, multicathode, 784
high-speed, 32-channel, 295
for photocell technique, 3076
speed-controlled, 2936
t.r., gas-discharge, electrode deterioration in, 1515
t.r. and a.t.r., gas-discharge, wide-band, 2044
waveguide, (A)2100
Synchronization, (See also Television)
of relaxation oscillations, 2656

T

Tachometer, electronic, 177
precision, 1730
Telecommunication engineering, recent developments in Britain, 1768
Telecontrol, by magnetic variometer, 1870
radio, for ship models, 1747
of radio transmitters, 2798
simulation as aid to system design, (A)2245
simulation of guided missile system (Typhoon), (A)2245
and theory of communication, 2535
Telegraphy, printing, tape relay system, 3107
Telemetry, application of communication theory to, 3041
for cosmic-ray radiosonde, 2495
f.m., linear discriminator for, 2783
f.m.-f.m. systems, (A)2245
techniques and applications, (A)2245
and guided-missile programme, (A)2245
of liquid level in tank, 1463
microwave, for Bonneville Power System, 1777
multichannel p.a.m.-f.m. system, 1443
p.t.m. system, (A)2245
p.w.m.-f.m. system, (A)2245
radio, 1978
f.m. system for radioactive snow-depth gauge, 1736
of raindrop size distribution, 3001
and telecontrol, 'operational analysis' method for study of, 1575
and theory of communication, 2535
Telephone earpieces, apparatus for testing, 2896
calibration of, American standard Z24.9-1949 for, 21
electrodynamic, Beyer DT 48, transmission characteristics of, 2625
objective measurements on, 2895
ring-armature, 1296
Telephony, emergency equipment for linking radio and line circuits, 2018
Television, (See also Aerials; Interference)
amplifiers, orthogam, 759
in U.S. receivers, 2561
475–890-Mc/s, using Type 5768 disk-seal triode, (A)2292
B.B.C. Lime Grove studios, 753
B.B.C. outside broadcasts, radio and cable links for, 2552
technique of, 752
B.B.C. research on, 2881
broadcasting, from several low-power stations, 3128
Broadcasting Committee report, 1949, 2282
cameras, 1264, (D)2556
and applications, 483
conductron, 1498
C.P.S. emitron, equipment for use with, 755
design of, and secondary emission, 1499
ériscope, development of, 478
flying-spot type, for slides, 2846, Type TK-3A, 1265
image iconoscope, operation of, 3137
image orthicon, light-transfer characteristics of, 481
non-storage, for films, 482
review of, 756
with transparent signal-plate, 479
colour, and colorimetry, (A)2292
comparison of systems, 1786
comparison of U.S. systems, 1003
dot-interlaced, analysis of synchronizing systems for, 2027, dot-arresting technique for, (A)2292
dot-sequential system, analysis for, 465, c.r. tube for, 2850, progress in, 1789, receiver circuits for, (A)2292, sampling principles for, 464
field-, line- and dot-sequential systems, 1787
flying-spot signal generator for, (A)2292
frequency-interlace, 466, 1004
multiplex transmission for, (A)2292
physiological basis of, 2843
projection c.r. tube with three phosphor bands, 1002
quality of reproduction in, 2553
R.C.A. 'mixed highs' system, 250
review of various systems of, 2026
spectrum utilization in, 3131
subjective sharpness of additive three-colour pictures, (A)2292
subtractive system of, 1259
test-pattern generator for, (A)2292
U.S. Senate Advisory Committee report on, 249, 3130
colour fundamentals for, 1610
common faults in, 3140
comparison of consecutive scanning-line signals, delay circuits for, 2842
comparison with other methods of transmitting information, 2028
Cossor extension unit for, 1196
c.r. tubes, all-glass, characteristics of, 1795
cosine deflection yoke for, 3138
Cr/Fe alloy for cones of, 136
design of 90° deflection tube, (A)2292
with e.s. focusing, 2560
fluorescence saturation in, 1923
flyback-type, h.v. supply for, 488
focusing properties and resolution of, 2852
low-reflection, 1501
optimum use of, 1502
permanent-magnet focusing for, (D)484, 2032
definition, dependence on nature of scanning spot, 2025
deflection circuit, self-oscillating, 490, 491
demonstration equipment, mobile, 460
developments in U.S.A., 1927–1950, 2030
distribution systems for apartment houses, 239
electronics in, 253
evolution of, 248
and film industry, definitions of resolution, 1495
h.f. cables for, 278
image quality, factors determining, 2029
rating of, 751
structure and transfer characteristics, 2293
industrial equipment, and applications, 1505
portable, using vidicon, (A)2292
international, problems of, 247
in Italy, 472
laboratory equipment for, 158
line selector with automatic identifier, (A)2292
line transmission, over short distances, 2877, 2291, 2841
links, long-distance, 238
sound diplexer for, 3126
measurements on power supplies, 50 IRE 23.S3 standard on, 1497
modulators, shunt-regulated amplifiers in, 2562
in N.W. Germany, development of, 3129
perspective distortion in, 2024
phase and gamma correction in, 473
picture flicker, critical brightness for perception of, 1503
programme-combining device for, Genlock, 2294
projection, c.r. tubes, R.C.A. Type 7NP4, 2851
large-screen, eidophor method for, 485, improvements in, 467, for theatres, 486
R.C.A. Pt-100 theatre equipment, 2847
receiver, high-definition, 3141, Philips Type 600A, test report on, 487
receivers, abacs for calculation of noise in, 3142
black-and-white/colour adapter unit for, 2844
Ge diode as video detector in, 2589
horizontal-deflection system and h.v. supply for, 3139
line-scanning circuit for, 489
matching frame-output stage to deflection coils, 1793, 2295
measurement of spurious radiation from, 51 IRE 17.S1 standard on, 3099
printed-circuit techniques in manufacture of, (A)2292
simplification of, 1267
s.s.b., design of, 2557
synchroflection deflection system for, (A)2292
tuners, u.h.f., (A)2292, u.h.f. and v.h.f., 2033, variable-inductance, for v.h.f. channels, 1269
u.h.f. converter for, (A)2292
video output-stage, design for, 1268
wide-angle deflection yoke design, (A)2292
reception, u.h.f. and v.h.f., in Bridgeport area, 2037
variation with frequency, 2281
of 819-line transmissions from Lille, 1010
of 507·25-Mc/s transmissions, 2563
recording, 254
with continuously moving film, 244, B.B.C. technique, 1006
film scanners for, 463, flying-spot, 3136
film scanners and techniques for, 1792
problems of, (A)2292
R.C.A. Kinephoto equipment for, 2555
16-mm cameras for, 3135
recording and reproducing techniques, comparison with cinematography, 1007
relay, Calais/London, 459, 1257
microwave, for Scotland, 462
resolution, improvement by v.m., 2296
scanning, by 'knight' method, 243
servicing and alignment methods, 1794
sound receivers, locked oscillator for, 2034
standardization in Italy, 470
standards, 468
comparative analysis of, 469
proposed, for Australia, 1008
625-line, C.C.I.R., 3133
stations, audio console for, 3112
economy and operating efficiency in, (A)2292
Kirk O'Shotts, 3143
stratovision in Switzerland, possibilities of, 3125
studio acoustics for, 2297
studio and outside-broadcasting practice in Great Britain, 471
studios, WOR, New York, 1270
in Switzerland, present state of, 1260
synchronization, automatic system of, 3134
external, for home receivers, 246
frame, 1494
synchronization-pulse testing, 50 IRE 23.S2 standard on, 750
synchronizing-signal generator, 470, 749
terminal equipment, for coaxial systems, 1005
R.C.A., test and alignment procedures for, 1201
test-pattern generator for, 2778
for theatres, proposed closed-loop system, 3132
tone rendering in, 757, 758
transmission, bandwidth and picture quality, 493
conversion from one standard to another, 2845
by p.c.m., 1496
and reception, on 480 Mc/s, 494
transmitters, u.h.f., phase-to-amplitude modulation for, 477, using 5-kW klystrons, 2849
1-kW, 475–890-Mc/s, parallel operation of valves in, (A)2292
underwater, by means of ultrasonics, 251
valves, transcontinental series of, 3162
video distribution system, 1790
video signals, 'rooter' for *n*th root of, 754
waveform monitors for, frequency response of, 2475
wide-band equipment for, 475
Temperature coefficients, of circuit components, measurement of, 2476
Tesla, life and work of, 2606
Test equipment, (See also Television and other individual subjects)
for a.m. and f.m. transmitters, 1964
automatic transmission-measurement set, 1194
for coaxial cables, 2231
signal generator and piston attenuator for 1–30 Mc/s, 1709
c.r.o., for display of transmission-amplitude characteristic of transmitter, (A)2226
for crystal mixers, 1200
for impedance of h.f. valves, 690
and methods, for 3-cm low-voltage klystrons, 683
for transistors, 398, 1533
Thermistors, development in France, and applications of, 44
resistance/temperature relation for, 1083
use in thermometers with linear calibration, 3067
use in ultrasonic interferometry, 3068
Thermostat, precision, for range 1000°–1550°C, 957
Thermometers, thermistor, design of, 3067
Thoria, semiconductor properties of, 2730
Thunderclouds, height of charges taking part in flash to ground, 1907
Thunderstorms, and earth's general electrification, 869
Time constants, measurement of, 1199
and frequency, measurement of, 2223
periodic fluctuation in length of day, 150
signals, transmissions in Australia, 1424
Timebases, slow-sweep, 1121
spiral, with magnetic and electric deflection, 73
Timers, electrical, 226
for moulding press, 955
thyratron circuits for control of machine operations, 956
Transceivers. See Transmitter-receivers
Transducers, $BaTiO_3$ ceramic, cylindrical, (A)559, ultrasonic, high-power, (A)560, 1818
coupling in, theory of, 808
crystal, variable resonance-frequency, 2319
electroacoustic, coupling theory for, (A)554
nonlinear distortion in, 1558
electromechanical, for producing waves in ground, 2085
linear arrays, directivity and efficiency of, (A)513
magneto-optical, 1295
mechano-electronic, for physiological applications, 2791
piezoelectric, equivalent circuits for, 2326
thickness-vibration, theory of, 99
piezoelectric and electrodynamic, 552
quartz-crystal, underwater sound field of, 1821
for servos, 2285
ultrasonic, 15–200 kc/s, construction and applications of, 2613
vibrating-string, vibrotron, for pressure and temperature measurements, (A)2245
Transductors, principles and applications of, 291
series, theory of, 1086
Transformers, a.f., iron-cored, waveform distortion in, calculation of, 1087
and chokes, minimum-cost, design of, 1853, 2931
small, Admiralty design of, 827
current, dielectric admittances in, 1089
double-ratio, 2115
toroidal, effect of capacitance on design of, 1090
double-tuned, for band-pass filters, 2929
h.f., low-power, wide-band, with laminated cores, 1579
iron-core, harmonic distortion in, measurement of, 2232
leakage reactance of, determination of, 1314

  low-power, use of Ni steels in, **289**
  magnetostriction effects in, **2313**
  mechanical, design and applications of, **2623**
  multi-winding, equivalent circuit for, **2930**
    leakage distribution in, **2928**
  output, with filter coupling, frequency response of, **2682**
  power, small, for aircraft, **(D)581**
  pulse, analysis and design of, **(A)2122**
  design of, **828**
  equivalent circuits for, **1313**
  exponential-line, **1301**
  wide-band, design of, **290**
Transients, in multiply periodic nonlinear systems, **1339**
  storage oscilloscope for observation of, **3055**
Transistors, **153**[illegible]
  background noise in, **779**
  characteristics of, analysis of, **775**
  circuits for, design of, **2369, 2662**
  effect of auxiliary current on operation of, **2591**
  in frequency-modulator circuits, **3147**
  Ge, *n-p-n*, circuit properties and applications of, **2957**
    p-n junction, **3177**
    p-type, **508**
    theory and applications of, bibliographical survey of, **778**
  in l.f. and m.f. amplifiers, **2958**
  physics and technology of, **1802**
  as reversible amplifiers, **509**
  in trigger circuits, **2661**
  with widely spaced contacts, **1803**
Transistron, amplification in, **1037**
Transmission lines, calculation of optimum load for, **(A)2106**
  coaxial, connectors for, **2906**
    correcting stubs for, **2635**
    couplings for, **2111**
    variable-length, **2907**
  curved, h.f. properties of, **2633**
  delay, of comb or interdigital type, **772**
    construction and applications of, **2914**
    continuously wound, variation of phase velocity at h.f., **2637**
    magnetic, for storing signals, **2339**
    magnetostrictive, **2107**, nickel, **(A)2100**
    for pulse lengthening, **2655**
    single-tapped coil type, **(A)2100**
    solenoid, distortion correction for, **52**
    ultrasonic, for storage of video signals, **2842**
  exponential, operation at cut-off wavelength and in stop range, **2338**
    pulse response of, **280, (C)1069**
  helical, field calculations for, **1349, 1350, 2978**
    theory of, **2691**
  h.f., for impedance matching, **833**
    long, attenuation equalization in, **2915**
  h.v., radio interference from corona on, **3102**
  impedance charts for, **1071**
  inhomogeneous, theory of, Fourier transforms in, **562, 2909**
  λ/4, resonant, radiation from, **1563**
  Lecher, sheathed, capacitance of, **29**
  matching sections for, design of, **300**
  multi-wire, e.m.-wave propagation along, **2332**
  nonuniform, e.m.-wave propagation along, **2334**
  parallel-wire, unshielded, effect of radiation on Q of resonant sections, **(A)2106**
  phase-constant determination from impedance measurements, **1710**
  problems of, geometrical solution of, **1068**
  propagation of transient and periodic waves along, **1070**
  representation by superposed balanced circuits, **2671**
  resonant, and lumped LC circuits, bandwidths of, **1107**
  r.f., skew-wire, radiation resistance of, **817**
  solenoidal, wave propagation along, **30**
  surface-wave, h.f., (See also Waves, e.m., surface), **281, 563, (D)1300, (D)2333, 2636**
  use of laminated conductors to reduce skin-effect losses in, **2908**
  for Wrotham aerial system, **2643**
  3-phase, h.f. propagation along, **1299**
Transmitter-receiver, f.m., 68–100-Mc/s, for motor cycles, **212**
  mobile, for 148–174 Mc/s, **3117**
  multiplex, 960-Mc/s, Westinghouse Type-FB, **988**
  portable, v.h.f., for military use, **2854**
    for 60–100-Mc/s band, **3109**
  50-Mc/s, for civil defence, **3110**
  112–122-Mc/s, for small aircraft, **763**
Transmitters, (See also Television)
  aircraft, 2·8–24-Mc/s, using impulse-controlled oscillator, **767**
  a.m., broadcasting, for Australia, **766**
  broadcasting, a.f. a.g.c. for, **318**
    f.m., high-power, **764**, u.s.w., for West German Federated Republic, specification for, **2856**, u.s.w., 100-W to 10-kW, **2858**
    measurement of distortion in, **2566**
    optimum spacing of, **1490**
  broadcasting and telegraphy, postwar, German, **2565**
  high-power, automatic tuning of, **765**
  for loran equipment, design of, **2300**
  measurement of adjacent-band radiation from, **2762**
  spark, 1–3 cm, for slightly damped cm waves, **2775**
  suppression of harmonics in, **3144**
  30-W, for 430 Mc/s, **2567**
  4-kW, 1036·8-Mc/s, crystal-controlled, **(A)2298**
  1–32-Mc/s, stabilized exciter unit for, **(A)2298**
Troposphere, (See also Atmosphere)
  conditions in, and cm-wave propagation, **1998**
  day-to-day variations of pressure and temperature to 5 km height, **875**
  radio-duct formation in, **1466**
Tungsten wire, recrystallization and grain growth in, **1411**
    treatment of, for valves, **1412**
Tuners, attenuating, high-power, for cavity resonators, **1859**
  television, variable-inductance, v.h.f., **1269**
    6BQ7 twin triode in, **2033**
  variable-filter, **733**
Tuning equipment, coaxial-cable, for power-line carrier-current systems, **211**
  networks, feedback amplifiers in, **1869**
    RC, bandspreading and scale equalization for, **1125**

U

Ultrasonic absorption. See Absorption.
  applications, **1976**
    determination of elastic constants of metals, **1731**
    flaw detection, **958, 3072**, developments in Germany, **3071**, examination of boiler plate and welded seams, **1441**, testing of large forgings, **2493**
    measurement of water velocity, **416**
    soldering of Al, **174**
    soldering irons for Al, **1732**
  generators. See Generators.
  interferometry, use of thermistors in, **3068**
  oscillations, effects of, on animal tissues, **1050**, on nerve tissue, **(A)526**
    generation of, **1291**
Ultrasonics, in everyday life, analysis of, **2886**
  field patterns in fluids, determination of, [illegible]
  heating of bone and bone marrow by, **(A)627**
  plastic lenses for, **1292**
  propagation, in animal tissues, **1048**
    in Ni, effects of magnetic field on, **642**
  propagation velocity, in gases at low pressures, **1828**
    in [illegible], **3064**
    in rubbers, **270**
    in solids, **(A)516, 1545**
  underwater receiver with 'point' probe, **1064**
Units, and generalized electrical formulae, **2405**
  M.K.S., **322**
    rationalized, in engineering education, **332**
  rationalization of, **323**

V

Vacuum gauges, electrical, review of, **1920**
    McLeod, reading errors of, **1159**
    using Pirani cooling of tungsten filament, **(D)640**
  pumps, diffusion, characteristics of, **121**
    ionization, **1395**
    molecular, design of, **1661**, rotary, disk-type, **1160**
  technique, effects due to silicone-oil vapour, **2740**
    efficiency of Ba getters at low pressures, **3012**
    formation of thin films of hydrocarbon, **2738**
    getter materials for, **499**
    getters, efficiency of, **122**
    problems of gas absorption in, **1679**
Valves, (See also Counter tubes; Transistor; Transistron)
  anode dissipation of, effect of high altitude on, **3164**
  beam-deflection, phase-modulator, **1805**
  characteristics, c.r.o. display of, **692, 1436, 2488**
  crystal, (See also Rectifiers; Transistors)
    Ge-diode, experimental, high-conductance, **2588**, as video detectors, **2589**
    Si, as frequency changers, **2070**
    Si- and Ge-diode, **2587**, characteristics of American types of, **2060**
    triode, review of, **2592**
  development by Telefunken since 1945, **2574**
  diode, field at cathode in, **506**
    gas, low-pressure, h.f. impedance of, **776**
    microwave, conductance over exponential part of characteristic, **3173**
    as noise generators, frequency range of, **3060**
    with oxide-coated cathodes, characteristics of, **(C)1801**, high-speed 10-V effect in, **3170**
    parallel-plane, potential and gradient distributions in, **3171**
    planar, space-charge, theory of, **2057**, space-charge-limited current in, **2585**, space-charge smoothing factor for, **2058, (D)2871**, theory of, **777, (C)1800**
    at saturation, investigation of, **3172**
    thermodynamics of, **2586, 2870**
  diode and triode, gas-filled, deionization time of, **2061**
  disk-seal, as grounded-grid dm-λ oscillators, **1280**
  double-cathode, spontaneous fluctuations in, **507, (C)3175**
  double-diode, analysis for, **3174**
  double-tetrode, v.h.f., QQE 06/40 (AX9903), **2062, 2567**
  for dry-battery operation, Type KP53, **(A)2304**
  effect of cooling on operation of, **3084**
  electrometer, Type BM4A, balanced-circuit design for, **3051**
  electron beams and e.m. waves in, interaction between, **3166**
  electron-coupler, for modulation and power control at u.h.f., **(A)2304**
  electron-wave, space-charge effects in, **3167**
    theory of, **2866**
  in ENIAC computer, maintenance of, **3163**
  for frequencies above 3 kMc/s, survey of, **1520**
  gas-filled, plasmatron, **(A)2304, 2869**
    rectifier, fundamental processes in, **258**
  glow-discharge, voltage-regulator, extinction voltages of, **3159**
  grid contact potential and grid current in, **264**
  high-power, demountable, for s.w. service, **2578**
  klystron, low-voltage, 3-cm, test methods and equipment for, **683**
    reflex, Type RHK 6332, for operation at 3-cm λ, **2069**
    single-cavity, for microwave relay links, **(A)2304**
    three-cavity, Type X-15, **(A)2304**
    Type SAC-19, as mixers, application to television relaying, **858, 1127**
    Type Z 1891, **2849**, with 6-Mc/s bandwidth, **(A)2304**
  life expectancy of, statistics of, **2045**
  life testing of, **2773**
  low-power, 500–1500 Mc/s, design of, **2065**
  magnetron, back heating of cathodes in, **789**
    in cut-off state, cylindrical type, **2600**, planar or quasi-planar type, **2599**, transition from cylindrical to planar type, **3185**
    cylindrical, multianode, analysis of space charge in, **2601**
    electron-optical mapping of space-charge field in, **1988**
    electron orbits in, **3186**
    frequency characteristics of, effects of space charge on, **1282**
    l.v., tunable, Type PAX3, **3184**
    mode interaction in, **(A)2304**
    multianode, single-cavity-resonator type, **(A)2304**
    for operation at 3-cm λ, **2066**
    planar, theory of, **2598**
    split-anode, operation of, **1120**
    for waveguide wide-band modulation, **1012**
  manufacture, Al-clad iron as Ni substitute in, **1949**
  materials for use in, **3161**
  miniature and subminiature, reliability of, **2573**
  multigrid, e.s. field in, **1279**
  new materials for, **(A)2194**
  nitrocellulose-base cements in, **1798**
  with oxide cathodes, life of, **3168**
  parallel-beam, theory of, **1018**
  pentode, input conductance at v.h.f., **1804**
    internal resistance of, **265, 3179**
    R.C.A. Type 5879, miniature, low-noise, **2063**
  performance analysis for large signal voltages, **1517**
  power, high-vacuum, rating of, **1799**
    secondary emission in, **(A)2304**
  reflex resnatron, **(A)2304**
    for wide-band operation, **(A)2304**
  residual-vacuum characteristic of, **1660**
  robust, design of, **2863**
  signal-retardation, with delay modulation, **2576**
  space-charge distribution in, **1514**
  switching, radial-beam, 30-element, **1030**
  television, transcontinental series of, **3162**
  test methods and apparatus of French P.T.T., **2772**
  tetrode, power, u.h.f., **(A)2304**, for 50-kW output up to 110 Mc/s, **(A)2304**
  thyratron, grid-circuit design for, **1983**
    hot-cathode, characteristics of, **(D)782**
    hydrogen-filled, switching-time limitations in, **(A)2304**
    pulse measurement of deionization time of, **781**
    trigger-grid, **2873**
  transmitting, end-cooling of filaments in, **1024**
    high-power, u.s.w., **2872**
    Types QQE 06/40 and QQC 04/15, **2062**
  travelling-wave, **501, 502, 1017**
    amplification of, **2579**, at 6-mm λ, **1521**
    'backward' gain in, **1019**
    comb and interdigital delay lines for, **772**
    using delay devices, **2865**
    with dispersive helices, **2581**
    effect of velocity spread of beam electrons on, **2580**
    with magnetic field, **1020**, anticyclotron, **260**, space-charge effects in, **1022**
    miniature, for 100 Mc/s to 1 kMc/s, **(A)2304**
    periodic-waveguide, for medium powers, **2047**
    small-signal theory of, **261**
    space-charge effects in, **262**
    theory of, **854, 1518**
    transmission-line equivalent of, **2046**
    with transverse electric and magnetic fields, **1276**
    wide-band swept-frequency measurements for, **(A)1958**
    10-W, Type-5929, **1519**
  triode, amplifier, microwave, **780**
    disk-seal, feedback admittance of, **2593**
    input conductance at v.h.f., **1904**
    negative-grid, equivalent networks for, **1321**
    planar, e.s. field in, calculation of, **1277**, grounded-grid, 500-Mc/s, **3178**, penetration factor and field in, **3176**, Type-1553, design factors of, **510**
    u.h.f., planar grids for, design and manufacture of, **2594**
  triode and pentode, interelectrode impedances in, **2590**
    operating conditions of, **2663**
  tuning-indicator, Type EM71, **3160**
  u.h.f., vacuum and crystal, French types, **3165**
  v.m., based on electron-plasma oscillations, **2875**
    with deceleration and acceleration of beam, **2068**
    efficiency of oscillation generation in, **2802**
    high efficiency, **1036**
    pendular multiplication of secondary electrons in, **799**
    space charge and phase focusing in, **(D)3187**
Variometer, air-cooled, for mobile s.w. transmitter, **2299**
  magnetic, **1870**
  u.s.w., with ferrite cores, **1677**
Varistors, characteristics and applications of, **2363**
Vector diagrams, for circuit frequency response, **1578**
Vibrations, sonic and ultrasonic, applications in biology, biochemistry and biophysics, bibliography of, **1813**
Voltage, direct, small, compensation and measurement of, **2760**, measurement of, **(A)2122**
  h.f., measurement methods for, **2761**
Voltmeters, a.c., differential, electronic, **689**
    expanded-scale, **160**
  e.s., using liquid dielectric, **947**
  high-impedance, photocells in, **401**
  square-law, rectifier-bridge type, **3052**
  thermocouple, for millivolt measurements at r.f., **161**
  valve, a.f., 1 mV–10 V, **2482**
    audion, **1988**
    negative-feedback, **2767**
    peak, instantaneous, **2481**
    for students' use, **400**
  for 50 μV–1 kV and frequencies 1 kc/s–30 Mc/s, **1198**

W

Wave propagation, acoustic, boundary-layer attenuation in tubes, **1045, (C)2609**
    in cylindrical conduit, **2**
    in ducts, normal modes in, **1543**
    in narrow conduits, **(C)3**
Wave propagation, e.m., (See also Field strength; Reception; Television; Transmission lines; Waveguides; Waves)
  in anisotropic medium, **2400**
  in atmospheric ducts, New Zealand, **200**
    theory of, **719, 1465**
  attenuation due to scattering, **2525**
  calculation of energy density and flux, **(A)2799**
  cm-λ, measurement of angle of arrival, **2523**
    mobile equipment for study of, **3115**
    scattering by atmospheric turbulence, **973, (D)1755**
  conditions during reception in South Africa of London 41·5-Mc/s television signals, **722**
  decametre, and geomagnetism, **2806**
  and deduction of critical frequencies, **1754**
  definitions of terms, 50 IRE 24.S1 standard on, **725**
  diurnal variation of propagation time and frequency, **2803**
  dm-λ, in Switzerland, **979**
  over earth's surface, analysis of, **(A)2648**
  effect of atmospheric layer of nonstandard refractive index, **(A)**[illegible], **(A)2799**
  effect of aurora of 19th Nov. 1949 on, **2716**
  fade-outs, and cosmic rays, **1763**
  fading, as diffraction problem, **428**
    of m.f. and h.f. waves, **(D)201**
    periodic, of s.w. signals, **981**
    at about 3·95 kMc/s, observations of, **(A)2263**
    at 4 kMc/s, observations using pulse technique, **(A)2263**
  field equations for region of variable μ and ϵ, **858**
  field-strength variations for 45–450 Mc/s, **3095**
  F_2-layer critical frequencies, variation of, **(A)2799**
    variations at stations 100–150 miles apart, **(A)2799**
  forecasts, comparison with observations, **2520**
    for decametre waves, **2813**
  in heterogeneous layers, **1882**
  beyond horizon, effective radius of earth for, **1475**
  Huyghens' principle, formulation of, **198**
  in inhomogeneous medium, W.K.B. approximation for, **3088**
  'internal' reflection in stratified medium, **718**
  in ionized gas with electric and magnetic fields, **2979**
  ionospheric, angle-of-arrival measurements, **3091**
    angle of arrival and polarization measurements at Fort Chimo, **(A)2799**
    asymmetrical, on Paris/Algiers link, **1467**
    computation of, **720**
    under conditions of absorption, **723**
    cross-modulation in, **1472**
    effect of D layer on very-low-frequency waves, **(D)724**
    effect of geomagnetic storms on, **2804**
    gyrofrequency in E layer, northern Canada, **2001**
    gyro-interaction in, measurement of, **155**, variation of resonance frequency in, **197**
    l.f., and long-distance aerial navigation, **1761**, at low and very low frequencies, **2522**
    measurement of angle of arrival, **2804**
    measurement of angle of departure, **1995**
    and moon echoes, **2264**
    origin of harmonics at points of zero dielectric constant, **721**
    and Poynting vector, **193**
    and refractive index, **3094**
    self-interaction near gyrofrequency, **1758**
  long-distance, in 10–30-kc/s and 0·5–1·1-Mc/s bands, **978**
  long-wave, use of atmospherics in study of, **1473, 1760**
  longitudinal and transverse, in Canada, **1471**
  Lorentz polarization term and ionospheric absorption, **2428**
  m-λ, **1228**
    measurement of angle of arrival, **432, 433**
    measurements in aircraft, **199**
    beyond optical range, **431**
  magneto-ionic theory, of group and phase velocities, **972**
    interpretation of, **1622**
    relativistic, **1351**
  mechanism of F-layer-propagated back-scatter echoes, **2808**
  microwave, effect of ocean waves on, **(A)2799**
    experiments on, **202**
    low-level atmospheric conditions and over-water interference patterns, **(A)2799**
    between parallel conducting surfaces, **(A)2100**
    through parallel-plate arrays, **(A)2100**
  Mögel-Dellinger effect, phenomena connected with, **1477**
  m.w., change at sunset in, **2809**
  over plane earth, analysis by saddle-point method, **2466**
  polarization of Z trace in northern Canada, **3090**
  and positions of planets, **1997**
  ray path in curved ionosphere layer, **1296**
  reception in Switzerland of WWV standard-frequency transmissions, **1178**
  reflection, from F_2 layer, anomalous variations of, **2526, 2527**
    in inhomogeneous medium, **2157**
    from ionosphere, and ground-wave scattering, **976**, of long waves, **(A)2799**, polarization of l.f. waves, **(A)2799**
  and refractive index of ionosphere, **3094**
  reliability of ray theory of, **2521**
  round-the-world signals, **726**
  Sommerfeld's radiation principle, [illegible]
  Sommerfeld's surface wave, **429**
    comparison of theories on, **2516**
    proof of nonexistence of, **2517**
  in stratified media, **857, 1340, 2157**
    theory of, **3089**
  s.w., fading due to interference between magneto-ionic components, **2815**
    ionospheric, effect of geomagnetic field on, **(A)2805**
    m.u.f. predictions, **1996, 2812**
    variation of velocity of, **2803**
  tropospheric, mathematical theory of, **(A)2799**
    scattering in, **2811**, theory of, **787**
    at 44·1 and 92·1 Mc/s over 167-mile path, **977, (A)1287**
    250–3000-Mc/s, between aircraft, **(A)2799**

  u.h.f., beyond horizon, **436**
  u.s.w., influence of troposphere on, **2524**
  v.h.f., effect of terrain on field strength, **(A)2799**
    experiments to determine factors in, **(A)2799**
  field strength measurements on plane and circularly polarized waves, **(A)2799**
  very short wave, meteorological aspects of, **1998**
  wave packets, Poynting vector and energy flow, **1881**, **2696**, **2697**
  work of the Australian Radio Research Board on, **1999**
  at 5–30-Mc/s, determination of skip distance and m.u.f. using long-distance back-scatter, **(A)2799**
  at 8–17 Mc/s, between Noumea and Adélie Land, **1231**
  at 28–148 Mc/s, anomalies during auroral displays, **2002**, **(A)2799**
  at 92·9-Mc/s, over 127-mile path, **(A)2799**
  at 0·3–10 kMc/s, **435**
  in 6-m band, effect of magnetic storms on, **(A)2799**, **2807**
Waveguides, acoustic, **1290**
  applicability of transmission-line theory to, **2639**
  application of quadripole theory to, **814**
  channel-separating filter arrangements for, **2104**
  circular, low-loss transmission in, **(A)2100**
    multimode, dominant transmission characteristics of, **(A)2100**
    open-ended, asymmetrical waves from, **2336**, diffraction effects with, **2337**
    probe measurements of mode conversion in, **(A)2100**
    properties of longitudinal slots in, **2105**
    wide-band quarter-wave plate for, **(A)2100**
  corrugated, as band-pass filters, **2912**
  dielectric-filled, in axial magnetic field, propagation in, **2911**
  effect of diaphragm on e.m. field in, **564**
  e.m. waves in, **565**
    stability and attenuation of, **813**
  equivalent circuits for, determination of parameters of, **(A)2100**
  field in, expansion in terms of normal modes, **1302**
    produced by currents and discontinuities, **2638**
  gas-filled, slow e.m. waves in, **1303**
  magic Tee, measurement of dielectric properties by, **3068**
  manufacturing methods for, **2913**
  metal, with parallelogram cross-section, **2910**
  multilayer, velocity of H_{0n} waves in, **2640**
  oscillations in, excitation by linear aerial, **2335**
  rectangular, with apertures, transmission in, **2102**
    radiation of dipole in, **816**
    two-dielectric, cut-off frequency for, **1841**
  resonant window for, design for high power, **566**
  slotted, as aerials, **815**
  switches for, **(A)2100**
  symmetrical, junctions in, analysis of, **2101**
  with two concentric dielectrics, propagation in, **1564**
Wavemeters, absorption, grid-dip, **2769**
Waves, (See also Diffraction; Sound)
  e.m., cm-λ, ponderomotive effects of, **681**
    elliptically polarized, **(D)1074**, complex-vector algebra of, **2419**, geometrical representation of, **2418**, synthesis and analysis of, **2416**, transmission and reception of, **(C)285**
    ionospheric, polarization of, **1464**
    microwave, generation by diffraction, **1354**
    in moving plasma, **717**
    plane, reflection by infinite set of plates, **1352**
    reflection by metal-plate structures, measurement of, **1880**
    reflection and refraction at set of parallel metal plates, **1138**
    reflection and transmission, by metal-plate structures, **1879**, by metal-plate structures and dielectric plates, **1878**, by thin curved shells, **93**
    r.f., effect of refractive index of ionized gas on emission and absorption of, **334**
    scattering of, **1762**, by ionized gases, **96**, by 'soft' spherical obstacles, **2189**, by spheres of size comparable with λ, **2417**
    submillimetre, production of, **(A)2122**
    surface, (See also Transmission lines, surface-wave) and application to transmission lines, **281**, **812**, **(D)2098**, determination of amplitude, **(A)2100**, interaction between transmission lines, **(A)2100**, along plane conductor, **2097**
    velocity determination by resonant-cavity method, **430**, **1225**
    vertically-polarized, phase velocity over surface of sphere, **(A)2799**
  linear, conservative, energy propagation in, **1621**
  magneto-hydrodynamic, in ionized gas, **2152**
    shock, theory of, **605**
  ultrasonic, radiation pressure in, **798**
    transmission and reflection by metal plate in water, **(A)524**
Wiring system, colour-coded, **2378**
Wobbulator, for simple c.r.o., design of, **412**

X

X-ray applications, examination of valves, **2506**
  liquid-level gauge, **(A)2245**
——**tubes**, cathode centering by minimum-capacitance method, **2597**
  fine-focus, e.s. focusing in, **1450**
  glass selection and production techniques for, **2214**
  image intensifiers for, **2507**
  resonant-cavity, 1-MV, **708**

ERRATA

In "Abstracts and References" throughout the year

Abstract No. 241 For 'See 275' read 'See 256'.
„ „ 280 For 'E. R. Schatz' read 'E. R. Schatz & E. M. Williams'.
„ „ 294 For 'J. B. Woodford' read 'J. B. Woodford, Jr'
„ „ 389 For 'Opérationel' read 'Opérationnel'.
„ „ 560 Change U.D.C. to 534.232 : 621.315.612.4.
„ „ 565 For 'See 1851 of 1950' read 'See 1861 of 1950'.
„ „ 879 Journal reference should read *Arch. Met. Geophys. Bioklimatol. A.*
„ „ 889 Journal reference should read *Arch. Met. Geophys. Bioklimatol. A.*
„ „ 1329 For '665·3' read '655.3'.
„ „ 1501 For 'G. S. Szegho' read 'C. S. Szegho'.
„ „ 1820 In line 6 for 'one' read 'tone'.
„ „ 2271 In title, for 'Adaptation' read 'Matching'.
„ „ 2352 Title should read "Aerials for Beam Stations".
„ „ 2596 In title, for 'A Note of' read 'A Note on'.
„ „ 2798 For 'Vol. 15' read 'Vol. 14'.
„ „ 2819 For 'Vol. 15' read 'Vol. 14'.
„ „ 2827 In title, for 'Adaptation' read 'Matching'.
„ „ 3172 In title, for 'log I f(F)' read 'log I = $f(\sqrt{F})$'.

U.D.C. Changes

Crystal counters 621.387.462†
Fluxmeters 621.317.444†
Geiger-Müller counters 621.387.424†
Gyrointeraction 621.317.353.3† : 621.396.11
Measurement of capacitance 621.317.335.2†
Measurement of permeability 621.317.411†
„ „ *Q* 621.317.337†
Proportional counters 621.387.422†
Radiation counters 621.387.4†
Scintillation counters 621.387.464†
Thermistors 537.312.6 : 621.315.592†

LIST OF JOURNALS

A selection of the journals which are regularly scanned is given below, together with the addresses of publishers or editorial offices and the abbreviations of titles as used in the Abstracts and References. Applications for copies of any journal should be made to the addresses given.

The full title of each journal is given first and is followed by the address, the abbreviated title being shown within parenthéses. In a few cases the nature of a journal is indicated, where neither the title nor the address shows it clearly.

A

Acta Polytechnica, Royal Swedish Academy of Engineering Sciences, Stockholm, Sweden. (*Acta polyt., Stockholm*)
Acta physica austriaca, Springer Verlag, Wien I, Mölkerbastei 5, Austria. (*Acta phys. austriaca*)
Alta Frequenza, Associazione Elettrotecnica Italiana, Milano (202), Via S. Paolo 10, Italy. (*Alta Frequenza*)
Analytical Chemistry, American Chemical Society, 1155 Sixteenth Street NW, Washington 6, D.C., U.S.A. (*Anal. Chem.*)
Annalen der Physik, J. A. Barth, Leipzig C1, Salomonstrasse 18B, Germany. (*Ann. Phys., Lpz.*)
Annales de Physique, Masson & Cie, 120 Boulevard Saint-Germain, Paris 6ᵉ, France. (*Ann. Phys., Paris*)
Annales de Radioélectricité, 10 Rue Carducci, Paris 19ᵉ, France. (*Ann. Radioélect.*)
Annales des Télécommunications, 3 & 5 Boulevard Pasteur, Paris 15ᵉ, France. (*Ann. Télécommun.*)
Annali di Geofisica, Istituto Nazionale di Geofisica, Citta universitaria, Rome, Italy. (*Ann. Geofis.*)
Applied Scientific Research, Martinus Nijhoff, The Hague, Holland. (*Appl. sci. Res.*)
Archiv der elektrischen Übertragung, Wiesbaden-Biebrich, Mühlweg 2, Germany. (*Arch. elekt. Übertragung*)
Archiv für Elektrotechnik, Springer Verlag, Berlin-Charlottenburg 2, Jebensstrasse 1, and Heidelberg, Neuenheimer Landstrasse 24, Germany. (*Arch. Elektrotech.*)
Archiv für Meteorologie, Geophysik und Bioklimatologie, Series A, Springer Verlag, Wien I, Mölkerbastei 5, Austria. (*Arch. Met. Geophys. Bioklimatol. A*)
Archiv für technisches Messen, R. Oldenbourg Verlag, München, Lotzbeckstrasse 2b, Germany. (*Arch. tech. Messen*)
Arkiv för Fysik, published for Royal Swedish Academy of Sciences by Almqvist & Wiksells Boktryckeri A.B., Stockholm, Sweden. (*Ark. Fys.*)
A.S.T.M. Bulletin, 20th and Northampton Streets, Easton, Pa., U.S.A. (*A.S.T.M. Bull.*)
Audio Engineering, Radio Magazines Inc., 10 McGovern Avenue, Lancaster, Pa., U.S.A. (*Audio Engng*)
Australian Journal of Applied Science, Commonwealth Scientific and Industrial Research Organization, 314 Albert Street, East Melbourne C2, Australia. (*Aust. J. appl. Sci.*)
Australian Journal of Instrument Technology, 414 Collins Street, Melbourne, Australia. (*Aust. J. Instrum. Tech.*)
Australian Journal of Scientific Research, Series A, 314 Albert Street, East Melbourne C2, Australia. (*Aust. J. sci. Res., Ser. A*)
A.W.A. Technical Review, Amalgamated Wireless (Australasia) Ltd, Sydney, Australia. (*A.W.A. tech. Rev.*)

B

B.B.C. Quarterly, British Broadcasting Corporation, 85 Marylebone High Street, London, W.1, England. (*B.B.C. Quart.*)
Beama Journal, British Electrical and Allied Manufacturers' Association 36 Kingsway, London, W.C.2, England. (*Beama J.*)
Bell Laboratories Record, 463 West Street, New York 14, N.Y., U.S.A. (*Bell Lab. Rec.*)
Bell System Technical Journal, American Telephone and Telegraph Company, 195 Broadway, New York 7, N.Y., U.S.A. (*Bell Syst. tech. J.*)
British Journal of Applied Physics, 47 Belgrave Square, London, S.W.1, England. (*Brit. J. appl. Phys.*)
Brown Boveri Review, Artillery Mansions, 75 Victoria Street, London, S.W.1, England. (*Brown Boveri Rev.*)
Bulletin de l'Académie des Sciences de l'U.R.S.S., (*a*) série physique, (*b*) série géographique et géophysique, (*c*) classe sciences techniques, Academy of Sciences, Moscow, U.S.S.R. (In Russian.) (*Bull. Acad. Sci. U.R.S.S.*, (*a*) *sér. phys.*, (*b*) *sér. géogr. géophys.*, (*c*) *tech. Sci.*)
Bulletin of the American Meteorological Society, Executive Secretary, 3 Joy Street, Boston 8, Mass., U.S.A. (*Bull. Amer. met. Soc.*)
Bulletin de l'Association suisse des Électriciens, 301 Seefeldstrasse, Zürich 8, Switzerland. (*Bull. schweiz. elektrotech. Ver.*)
Bulletin de la Société française des Électriciens, 8–14 Avenue Pierre Larousse, Malakoff (Seine), France. (*Bull. Soc. franç. Élect.*)
Bulletin technique de la Suisse romande, F. Rouge & Cie, Lausanne, Switzerland. (*Bull. tech. Suisse romande*)

C

Câbles & Transmission, Sotelec, 16 Rue de la Baume, Paris 8ᵉ, France. (*Câbles & Transmission, Paris*)
Canadian Journal of Physics, National Research Council, Ottawa, Canada. (*Canad. J. Phys.*)
Chalmers tekniska Högskolas Handlingar, N. J. Gumperts Bokhandel, Göteborg, Sweden. (*Chalmers tekn. Högsk. Handl.*)
Communication News, Philips Telecommunication Industries, Hilversum, Holland. (*Commun. News*)
Communications on Pure and Applied Mathematics, Interscience Publishers Inc., 250 Fifth Avenue, New York 1, N.Y., U.S.A. (*Commun. pure appl. Math.*)
Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences, Gauthier-Villars, Quai des Grands Augustins 55, Paris, France. (*C. R. Acad. Sci., Paris*)
Comptes Rendus (Doklady) de l'Académie des Sciences de l'U.R.S.S., Academy of Sciences, Moscow, U.S.S.R. (In Russian.) (*C. R. Acad. Sci. U.R.S.S.*)

D

Distribution of Electricity, 95 Aldwych, London, W.C.2, England. (*Distrib. Elect.*)

E

Electrical Communication, International Telephone and Telegraph Corporation, 67 Broad Street, New York 4, N.Y., U.S.A. (*Elect. Commun.*)
Electrical Engineering, Journal of the American Institute of Electrical Engineers, 500 Fifth Avenue, New York 18, N.Y., U.S.A. (*Elect. Engng, N.Y.*)
Electrical Manufacturing, 1250 Sixth Avenue, New York 20, N.Y., U.S.A. (*Elect. Mfg, N.Y.*)
Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, England. (*Elect. Times*)
Electrician, Bouverie House, 154 Fleet Street, London, E.C.4, England. (*Electrician*)
Electronic Engineering, 28 Essex Street, London, W.C.2, England. (*Electronic Engng*)
Electronics, 99–129 North Broadway, Albany 1, N.Y., U.S.A. (*Electronics*)
Elektrotechnik, Berlin, N.W.7, Clara-Zetkinstrasse 41, Germany. (*Elektrotechnik, Berlin*)
Elektrotechnik und Maschinenbau, Journal of the Elektrotechnischer Verein Österreichs, Springer Verlag, Wien I, Mölkerbastei 5, Austria. (*Elektrotech. u. Maschinenb.*)
Elektrotechnische Zeitschrift, Westermann Verlag, Braunschweig, Riddagshäuser Weg 66, Germany. (*Elektrotech. Z.*)
Endeavour, Imperial Chemical Industries, Nobel House, Buckingham Gate, London, S.W.1, England. (*Endeavour*)
Engineer, 28 Essex Street, London, W.C.2, England. (*Engineer, Lond.*)
Engineering, 35 & 36 Bedford Street, London, W.C.2, England. (*Engineering, Lond.*)
Ericsson Review, Stockholm 32, Sweden. (*Ericsson Rev.*)

F

Fernmeldetechnische Zeitschrift, Vieweg & Sohn, Braunschweig, Burgplatz 1, Germany. (*Fernmeldetech. Z.*)
FM-TV, 264 Main Street, Great Barrington, Mass., U.S.A. (*FM-TV*)
Frequenz, Schiele & Schön, Berlin, S.W.29, Boppstrasse 10, Germany. (*Frequenz*)
Funk und Ton, Verlag für Radio-Foto-Kinotechnik G.m.b.H., Berlin-Borsigwalde, Eichborndamm 141–167, Germany. (*Funk u. Ton*)

G

G.E.C. Journal, General Electric Company, Magnet House, Kingsway, London, W.C.2, England. (*G.E.C. J.*)
General Electric Review, General Electric Company, 1 River Road, Schenectady 5, N.Y., U.S.A. (*Gen. elect. Rev.*)
General Radio Experimenter, General Radio Company, 275 Massachusetts Avenue, Cambridge 39, Mass., U.S.A. (*Gen. Radio Exp.*)

H

Helvetica Physica Acta, Journal of the Société suisse de Physique, Éditions Birkhäuser, Bâle, Switzerland. (*Helv. phys. Acta*)
HF, 55 Rue Defacqz, Brussels, Belgium. (*H.F, Brussels*)

I

Indian Journal of Physics, (and Proceedings of the Indian Association forthe Cultivation of Science), 210 Bowbazer Street, Calcutta, India. (*Indian J. Phys.*)

Industrial and Engineering Chemistry, American Chemical Society, 1155 Sixteenth Street NW, Washington 6, D.C., U.S.A. (*Industr. Engng Chem.*)

J

Journal of the Acoustical Society of America, American Institute of Physics, 57 East 55th Street, New York 22, N.Y., U.S.A. (*J. acoust. Soc. Amer.*)

Journal of Applied Physics, American Institute of Physics, 57 East 55th Street, New York 22, N.Y., U.S.A. (*J. appl. Phys.*)

Journal of Atmospheric and Terrestrial Physics, Butterworth-Springer Ltd, 4–6 Bell Yard, London, W.C.2, England. (*J. atmos. terr. Phys.*)

Journal of the British Institution of Radio Engineers, 9 Bedford Square, London, W.C.1, England. (*J. Brit. Instn Radio Engrs*)

Journal of the Franklin Institute, Prince and Lemon Streets, Lancaster, Pa, U.S.A. (*J. Franklin Inst.*)

Journal of Geophysical Research, Johns Hopkins Press, Baltimore 18, Maryland, U.S.A. (*J. geophys. Res.*)

Journal of the Institution of Engineers, Australia, Science House, Gloucester & Essex Streets, Sydney, Australia. (*J. Instn Engrs, Aust.*)

Journal of Mathematics and Physics, Massachusetts Institute of Technology, Cambridge 39, Mass., U.S.A. (*J. Math. Phys.*)

Journal of Metals, American Institute of Mining and Metallurgical Engineers Inc., 29 West 39th Street, New York 18, N.Y., U.S.A. (*J. Metals*)

Journal of the Optical Society of America, American Institute of Physics, 57 East 55th Street, New York 22, N.Y., U.S.A. (*J. opt. Soc. Amer.*)

Journal de Physique et le Radium, 12 Place Henri-Bergson, Paris 8^e France. (*J. Phys. Radium*)

Journal of Research of the National Bureau of Standards, U.S. Government Printing Office, Washington, D.C., U.S.A. (*Bur. Stand. J. Res.*)

Journal of Scientific Instruments, 47 Belgrave Square, London, S.W.1, England. (*J. sci. Instrum.*)

Journal of the Society of Glass Technology, Secretary, J. H. Partridge, Elmfield, Northumberland Road, Sheffield 10, England. (*J. Soc. Glass Tech.*)

Journal of the Society of Motion Picture and Television Engineers, 342 Madison Avenue, New York 17, N.Y., U.S.A. (*J. Soc. Mot. Pict. Televis. Engrs*)

Journal of the Television Society, G. Parr (Ed.), 68 Compton Road, London, N.21, England. (*J. Televis. Soc.*)

M

Marconi Review, Marconi House, Chelmsford, England. (*Marconi Rev.*)

Materials and Methods, Reinhold Publishing Corporation, 330 West 42nd Street, New York 18, N.Y., U.S.A. (*Materials & Methods*)

Metal Industry, Louis Cassier Company Ltd, Dorset House, Stamford Street, London, S.E.1, England. (*Metal Ind., Lond.*)

Metal Progress, American Society for Metals, 7301 Euclid Avenue, Cleveland 3, Ohio, U.S.A. (*Metal Progress*)

Metal Treatment, 49 Wellington Street, London, W.C.2, England. (*Metal Treatm.*)

Metallurgia, Kennedy Press Ltd, 21 Bedford Street, London, W.C.2, England. (*Metallurgia, Manchr*)

Meteorological Magazine, His Majesty's Stationery Office, York House, Kingsway, London, W.C.2, England. (*Met. Mag.*)

Microtecnic, Lausanne, Switzerland. (*Microtecnic, Lausanne*)

Modern Plastics, 122 East 42nd Street, New York 17, N.Y., U.S.A. (*Mod. Plast.*)

Monthly Notices of the Royal Astronomical Society, Burlington House, London, W.1, England. (*Mon. Not. R. astr. Soc.*)

N

Nature, Macmillan & Co. Ltd, St. Martin's Street, London, W.C.2, England. (*Nature, Lond.*)

Naturwissenschaften, Springer Verlag, Berlin-Charlottenburg 2, Jebensstrasse 1, Germany. (*Naturwissenschaften*)

Nucleonics, 212 East York Street, York, Pa, U.S.A. (*Nucleonics*)

O

Observatory, Royal Observatory, Herstmonceux Castle, Hailsham, Sussex, England. (*Observatory*)

Onde électrique, 40 Rue de Seine, Paris 6^e, France. (*Onde élect.*)

Optik, Wissenschaftliche Verlagsgesellschaft, Stuttgart 1, Postfach 40, Germany. (*Optik*)

Osterreichische Zeitschrift für Telegraphen- Telephon- Funk- und Fernsehtechnik, Springer Verlag, Wien I, Mölkerbastei 5, Austria. (*Öst. Z. Telegr. Teleph. Funk Fernsehtech.*)

P

Philips Research Reports, N.V. Philips Gloeilampenfabrieken, Eindhoven, Holland. (*Philips Res. Rep.*)

Philips Technical Review, (as for **Philips Research Reports**). (*Philips tech. Rev.*)

Philosophical Magazine, Taylor & Francis Ltd, Red Lion Court, Fleet Street, London, E.C.4, England. (*Phil. Mag.*)

Philosophical Transactions of the Royal Society, Cambridge University Press, Bentley House, London, N.W.1, England. (*Philos. Trans.*)

Physica, Journal of the Dutch Physical Society. Martinus Nijhoff, Lange Voorhout 9, 's-Gravenhage, Holland. (*Physica, 's Grav.*)

Physical Review, 57 East 55th Street, New York 22, N.Y., U.S.A. (*Phys. Rev.*)

Post Office Electrical Engineers' Journal, Engineer-in-Chief's Office, Alder House, Aldersgate Street, London, E.C.1, England. (*P.O. elect. Engrs' J.*)

Poste e Telecomunicazioni, Ministero P.T., Viale Aventino 19, Roma, Italy. (*Poste e Telecomunicazioni*)

Proceedings of the Cambridge Philosophical Society, Cambridge University Press, Bentley House, London, N.W.1, England. (*Proc. Camb. phil. Soc.*)

Proceedings of the Institute of Radio Engineers, 1 East 79th Street, New York 21, N.Y., U.S.A. (*Proc. Inst. Radio Engrs*)

Proceedings of the Institution of Electrical Engineers, Parts I, II & III, Savoy Place, London, W.C.2, England. (*Proc. Instn elect. Engrs*)

Proceedings of the Institution of Radio Engineers, Australia, Science House, Gloucester Street, Sydney, N.S.W., Australia. (*Proc. Instn Radio Engrs, Aust.*)

Proceedings of the National Electronics Conference, 852 East 83rd Street, Chicago 19, Illinois, U.S.A. (*Proc. nat. Electronics Conference, Chicago*)

Proceedings of the Physical Society, 1 Lowther Gardens, Prince Consort Road, London, S.W.7, England. (*Proc. phys. Soc.*)

Proceedings of the Radio Club of America, 11 West 42nd Street, New York, N.Y., U.S.A. (*Proc. Radio Cl. Amer.*)

Proceedings of the Royal Society, Cambridge University Press, Bentley House, London, N.W.1, England. (*Proc. roy. Soc.*)

Q

QST, American Radio Relay League Inc., 38 La Salle Road, West Hartford 7, Conn., U.S.A. (*QST*)

Quarterly of Applied Mathematics, Brown University, Providence 12, R.I., U.S.A. (*Quart. appl. Math.*)

Quarterly Journal of the Royal Meteorological Society, 49 Cromwell Road, London, S.W.7, England. (*Quart. J. R. met. Soc.*)

R

Radio française, 92 Rue Bonaparte, Paris 6^e, France. (*Radio franç.*)

Radio professionnelle belge, Avenue Molière 1, Brussels. Belgium. (*Radio prof. belge*)

Radio professionnelle, 81 Rue de la Pompe, Paris 16^e, France. (*Radio prof., Paris*)

Radio Technical Digest (Edition française), 122 Boulevard Murat, Paris 16^e, France. (*Radio tech. Dig., Édn franç.*)

Radio Technik, Wien VI, Mariahilferstrasse 71, Austria. (*Radio Tech., Vienna*)

Radio & Television News, Ziff Davis Publishing Company, 185 N. Wabash Avenue, Chicago 1, Illinois, U.S.A. (*Radio & Televis. News*)

RCA Review, RCA Laboratories Division, Princeton, N.J., U.S.A. (*RCA Rev.*)

Reports on Progress in Physics, The Physical Society, 1 Lowther Gardens, Prince Consort Road, London, S.W.7, England. (*Rep. Progr. Phys.*)

Research, Butterworth's Scientific Publications Ltd, 4–6 Bell Yard Temple Bar, London, W.C.2, England. (*Research, Lond.*)

Review of Scientific Instruments, 57 East 55th Street, New York 22, N.Y., U.S.A. (*Rev. sci. Instrum.*)

Reviews of Modern Physics, 57 East 55th Street, New York 22, N.Y., U.S.A. (*Rev. mod. Phys.*)

Revista de Telecomunicación, Palacio de Comunicaciones, Madrid, Spain. (*Rev. Telecomunicación, Madrid*)

Revue belge de l'Electronique, 60 Rue Ravenstein. Brussels, Belgium. (*Rev. belge Électronique*)

Revue générale de l'Électricité, 12 Place Henri Bergson, Paris 8^e, France. (*Rev. gén. Élect.*)

Revue d'Optique, 3 & 5 Boulevard Pasteur, Paris 15^e, France. (*Rev. d'Optique*)

Revue scientifique. 4 Rue Pomereu, Paris 16^e, France. (*Rev. sci., Paris*)

Revue technique Compagnie française Thomson Houston, 173 Boulevard Haussmann, Paris, France. (*Rev. tech. Comp. fran. Thomson-Houston*)

Ricerca scientifica, Roma, Piazzale delle Scienze 7, Italy. (*Ricerca sci.*)

R.S.G.B. Bulletin, New Ruskin House, Little Russell Street, London, W.C.1, England. (*R.S.G.B. Bull.*)

S

Schweizer Archiv für angewandte Wissenschaft und Technik, Buchdruckerei Vogt-Schild, Solothurn, Switzerland. (*Schweiz. Arch. angew. Wiss. Tech.*)

Scientific Monthly, 10 McGovern Avenue, Lancaster, Pa, U.S.A. (*Sci. Mon.*)

Sylvania Technologist, Lawrence Street, Flushing, N.Y., U.S.A. (*Sylvania Technologist*)

T

Technical Bulletin of the National Bureau of Standards, U.S. Government Printing Office, Washington 25, D.C., U.S.A. (*Tech. Bull. nat. Bur. Stand.*)

Technique moderne, 92 Rue Bonaparte, Paris 6^e, France. (*Tech. mod.*)

Technische Mitteilungen, Journal of the Swiss Post Office, Direction générale PTT, Berne, Speichergasse 6, Switzerland. (*Tech. Mitt. schweiz. Telegr.-TelephVerw.*)

Tele-Tech, 480 Lexington Avenue, New York 17, N.Y., U.S.A. (*Tele-Tech*)

Telefunken Zeitung, Telefunken G.m.b.H., Berlin S.W.61, Mehringdamm 32–34, Germany. (*Telefunken Ztg*)

Télévision, 9 Rue Jacob, Paris 6^e, France. (*Télévision*)

Television Engineering, Bryan Davis Publishing Co. Inc., 52 Vanderbilt Avenue, New York 17, N.Y., U.S.A. (*TV Engng, N.Y.*)

Tijdschrift van het Nederlands Radiogenootschap, Oude Utrechtseweg 8, Baarn, Holland. (*Tijdschr. ned. Radiogenoot.*)

Toute la Radio, 9 Rue Jacob, Paris 6^e, France. (*Toute la Radio*)

Transactions of the American Geophysical Union, National Academy of Sciences, Washington, D.C., U.S.A. (*Trans. Amer. geophys. Union*)

Transactions of the American Institute of Electrical Engineers, 33 West 39th Street, New York 18, N.Y., U.S.A. (*Trans. Amer. Inst. elect. Engrs*)

Transactions of the South African Institute of Electrical Engineers, corner Marshall and Holland Streets, Johannesburg, S. Africa. (*Trans. S. Afr. Inst. elect. Engrs*)

T.S.F. pour Tous, 40 Rue de Seine, Paris 6^e, France. (*T.S.F. pour Tous*)

V

Le Vide, Journal of the Société française des Ingénieurs Techniciens du Vide, 44 Rue de Rennes, Paris 6^e, France. (*Le Vide*)

W

Weather, 49 Cromwell Road, London, S.W.7, England. (*Weather, Lond.*)

Wireless Engineer, Dorset House, Stamford Street, London, S.E.1, England. (*Wireless Engr*)

Wireless World, (as for **Wireless Engineer**). (*Wireless World*)

Z

Zeitschrift für angewandte Mathematik und Physik, Éditions Birkhäuser, Bâle, Switzerland. (*Z. angew. Math. Phys.*)

Zeitschrift für angewandte Physik, Springer Verlag, Berlin-Charlottenburg 2, Jebensstrasse 1, Germany. (*Z. angew. Phys.*)

Zeitschrift für Meteorologie, Akademieverlag G.m.b.H., Berlin, N.W.7, Schiffbauerdamm 19, Germany. (*Z. Met.*)

Zeitschrift für Naturforschung, Tübingen, Johannesweg 11, Germany. (*Z. Naturf.*)

Zeitschrift für Physik, Springer Verlag, Berlin-Charlottenburg 2, Jebensstrasse 1, Germany. (*Z. Phys.*)

Zhurnal [illegible] y teoreticheskoi Fiziki, Academy of Sciences, Moscow, U.S.S.R. (*Zh. eksp. teor. Fiz.*)

Zhurnal tekhnicheskoi Fiziki, Academy of Sciences, Moscow, U.S.S.R. (*Zh. tekh. Fiz.*)

Section VII—1952

Index to

Abstracts and References

This section contains an index, listed separately by author and by subject, for all Abstracts and References published in PROCEEDINGS OF THE IRE from February, 1952, through January, 1953.

AUTHOR INDEX

AUTHOR INDEX—A name followed by "and" is that of the first author of a jointly written paper, while the word "with" indicates that the name indexed is that of the second author.

A

Abbey, R. L., velocity of sound in gases at low pressures, **2691**
Abbott, F. R., design of buried-conductor r.f. ground system, **2729**
Abe, Z., with Y. Watanabe, s.w. narrow-band-pass crystal filters, **354**
Abel, W. G., and L. C. Edwards, source of long-distance back-scatter, **1062**
Aberdam, H., photography of oscillograms and television images, **1647**
Abgrall, C., and I. Epelboin, temperature variations of thin mumetal tapes in weak alternating fields, **2529**
Abild, B., abnormal u.s.w. ranges and their meteorological causes, **2580**
—— and others, u.s.w. propagation and meteorological influences, **3217**
Absalom, H. W. L., General Assembly of International Union of Geodesy and Geophysics, Brussels, 1951, **1598**
Abson, W., with D. Taylor, radiation-measurement instruments for X rays to cosmic rays, **1989**
Accardo, C. A., with others, 'injected' light emission from SiC crystals, **154**
Ackerman, S. L., with J. B. Wynn, Jr, guided-missile test-centre telemetry system, **1990**
Acton, J. R., single-pulse dekatron, **1787**
Adam, M., telecommunications, radio navigation and electronics at 19th Salon international de l'Aéronautique, Paris, 1951, **2097**; French regulations for protection of broadcasting against interference of industrial origin, **3223**
Adams, G. K., repetitive spark source for shadow and schlieren photography, **1888**
Aden, A. L., and M. Kerker, scattering of e.m. waves from two concentric spheres, **1259**
Adler, R., miniature travelling-wave valve, **866**
Adler, R. B., e.m. waves on inhomogeneous cylindrical structures, **1831**
Admiraal, D. J. H., RC oscillators, **1870**
Adorian, P., and A. H. Dickinson, h.f. broadcasting with vertical radiation, **2335**
Adrianiva, I. I., and I. L. Sokol'skaya, rectifying properties of PbS, **1343**
Agdur, B. N., double-stream amplifier valve, **1154**
—— and C. G. L. Åsdal, noise measurements on travelling-wave valve, **1152**
Agostinelli, C., epicycloidal functions and new relations between Bessel's functions, **1944**
Ahearn, A. J., effect of inhomogeneities on electrical properties of diamond, **1640**
Ahmed, R., linear analysis of electronic switching, **930**
Aida, Y., with Y. Nomura, radiation impedance of rectangular plate with infinite baffle, **301**
Aigrain, P., superdirective aerials, **2120**; rectification phenomena and transistor action in Ge, **2234**
—— and others, semiconducting properties of Te, **3450**
—— with others, semiconducting properties of molybdenite, **3454**
Ainlay, A., with others, saturable reactors as r.f. tuning elements, **3394**
Ajioka, J. S., with O. C. Haycock, radiation characteristics of helical aerials, **2995**
Aka, E. Z., with M. E. Straumanis, lattice parameters, expansion coefficients, and atomic weights of purest Si and Ge, **2541**
Akeley, E., with D. Caplan, axial motion of electron in linear accelerator, **3518**
Akhiezer, A. I., and Ya. B. Faynberg, slow e.m. waves, **1829**; h.f. oscillations in electron plasma, **3411**
—— and G. Ya. Lyubarski, nonlinear theory of oscillations in electron plasma, **3063**
Akulov, N. S., and G. S. Krinchik, eddy currents due to displacement of domain boundaries, **3115**
Albersheim, W. J., measurement techniques for wide-band long-distance radio relay systems, **2551**
—— and J. P. Schafer, echo distortion in f.m. transmission of frequency-division multiplex, **2022**
—— with L. F. Hunt, c.r.o. scanner for measurement of delay distortion, **2286**
Albert, V. F., with C. S. McGinnis, multiple Helmholtz resonators, **3311**
Alden, E. D., with L. R. Koller, electron penetration and scattering in phosphors, **152**
Aleksandrov, N. V., measurement of properties of highly absorbing dielectrics, **1370**
Alers, P. B., and R. T. Webber, anomalous magnetoresistance of Bi at low temperatures, **1629**
Alexander, B., long-range-navigation instrumentation, **1925**
Alexander, W., electrical resonance, **3367**
Alexander, W. H., judgment box, **217**
Alf, F., measurement of power of h.f. generators, **1035**
Alixant, M., bibliography of magnetic recording, **24**; new radio components in world market, **628, 2673**; ultrasonic generators and applications, **1182**
Allard, L. S., design and operation of television c.r. tubes, **842**
Allart, G., with M. Langevin, 10-channel pulse-amplitude analyser, **2130**
Allee, G. L., with L. T. Sachtleben, ultra-speed theatre-television projection systems, **1453**
—— with others, image-orthicon colour-television camera optical system, **2907**
Allen, D. N. de G., and S. C. R. Dennis, relaxation methods in solution of boundary-value potential problems, **1354**
Allen, J. E., distribution of electron energies in high-current discharge, **100**
Allen, W. A., and P. H. Parkin, acoustics and sound exclusion, **13**
Allred, C. M., abac for TE_{11}-mode piston attenuator, **2467**
Almond, M., summer daytime meteor streams of 1949 and 1950, **387**
—— J. G. Davies and A. C. B. Lovell, velocity distribution of sporadic meteors, **1899**
Alons, L., developments in the gramophone world, **1507**
Al'pert, Ya. L., and A. A. Aynberg, effects of ionosphere irregularities, **130**
Alsberg, D. A., sweep-frequency method of vector-impedance measurement, **728**
Altenburg, K., analogy between corpuscular theory of sound propagation in fluids and theory of quadripoles, **1491**
Aly, M. K., Khartoum expeditions for solar eclipse Feb. 1952, **2787**
Amos, B., and W. Heiser, internal television-receiver interference, **1143**
Amos, S. W., and G. G. Johnstone, sensitive tuned-r.f. receiver, **1092**
Amster, L., with others, C.S.F. television transmitters, **3576**
An Wang. See Wang, An.
Ananthakrishnan, R., solar prominences and sunspot cycle, **3422**
Anderson, D. V., reflection of acoustic pulse by paraboloid, **2683**
—— T. D. Northwood and C. Barnes, reflection of pulse by spherical surface, **2682**
Anderson, F. B., seven-league oscillator, **81**, **(C)1869**
Anderson, G. M., and E. M. Williams, transient response of asymmetrical carrier systems, **493**
Anderson, L. J., and J. R. Johnson, light-weight pickup and tone arm, **888**
Anderson, S. R., with others, Civil Aeronautics Administration v.h.f. omnirange aid, **1000**, **(C)2814**
Anderson, W. N., with W. D. Richardson, cross-channel television, **821**
Andrejewski, W., diffraction of plane e.m. waves by circular disk or aperture, **868**
Andrieu, R., line-scan circuit with economy transformer, **3580**
Andrieux, —, and — Dayonnet, equipment for comparison of nearly equal frequencies, **1979**
Angel, Y., and P. Riche, Paris-Lille television radio link, **2627**
Angelakos, D. J., current and charge distributions on aerials and open-wire lines, **592**
Anner, G. E., Elements of Television Systems, **(B)1145**
Anspacher, W. B., pentode amplifier with positive feedback, **853**
Antes, L. L., and N. Hackerman, contact potential variations of freshly condensed metal films at low pressures, **[illegible]**
Apgar, E. G., with others, h.v. cold-cathode rectifier, **2927**
Appleby, J. S., with W. T. Bane, automatic control of electrical power, **3561**
Appleton, E. V., magnetic and ionospheric storms, **395**
—— and W. R. Piggott, statistics of storms in F_2 layer, **2802**
Ardillon, J. M., dependence of ionospheric disturbances on local time, **2795**
Argence, E., e.m. waves in ionosphere, paths in, **1063**, phase path of, **2315**
—— M. Mayot and K. Rawer, electron distribution in ionosphere and s.w. absorption, **1300**
—— with K. Rawer, characteristics of ionosphere E region, **1601**
—— with others, determination of collision frequencies in E and F regions, **[illegible]**
Arley, N., and K. R. Buch, Introduction to the Theory of Probability and Statistics, **(B)1361**
Armour, A. M., A. J. King and J. W. Walley, developments and simplifications in permeameters, **3499**
Armstrong, H. L., with J. V. Hughes, dielectric constant of dry air at 3 kMc/s, **3127**
Arnold, A. H. M., a.c. resistance of single-layer inductance coils, **609**; performance limits in electrical instruments, **1971**
Arnold, E., with others, u.s.w. propagation and meteorological influences, **3217**
Arnold, R., with J. van Calker, thermal conductivity of electrets, **3443**
Arnoult, R., with A. Lebrun, coaxial-line permittivity measurements at m and dm λ, **1956**
Arpiarian, N., inhibiting action of Fe on luminescence of ZnS, **421**
—— and D. Curie, electron levels in phosphors with Fe, Ni or Co poison centres, **2232**
Arthur, J. B., with E. H. Putley, PbS, an intrinsic semiconductor, **425**
von Arx, A., 31-MeV betatron installation at Zürich, **1994**
Arzeliès, H., matrix and tensor form of fundamental relations of magneto-ionic theory, **3416**
Asbury, W. D., K. M. B. Wright and W. M. Lloyd, first British multi-channel television receiver, **2915**
Aschen, R., television camera equipment, **520**
—— and P. Gaillard, simple ionosphere sounder, **1917**
Ascione, A., and C. Micheletta, radio propagation experiments at 33 Mc/s, **787**
Åsdal, C. G. L., with B. N. Agdur, noise measurements on travelling-wave valve, **1152**
Ashdown, G. L., and K. L. Selig, general-purpose differential analyser, **1649**
Aslakson, C. I., and O. O. Fickeissen, effect of meteorological conditions on shoran measurement of long distances, **1610**
Aspden, H., two-fluxmeter method of measuring hysteresis loss, **2274**; eddy currents in cores with nonuniform permeability, **3122**
Aspinall, A., and G. S. Hawkins, summer daytime meteor streams of 1949 and 1950, **385**
Assadourian, F., distortion of f.m. signal by small loss and phase variations, **2027**
Assmus, F., and F. Pfeifer, resistance anomalies in supermalloy, **691**
Astbury, N. F., geomagnetic variations during solar eclipse, 25th Feb. 1952, **3425**
Atanasijevic, I., radiation from Milky Way on 255 Mc/s, **3423**
—— with others, observations of solar eclipse, 25th Feb. 1952, **2785**
Atkinson, R. B., and S. G. Ellis, ferrography, **1705**
Atlee, R. Y., electronic protection systems, **218**
Atterling, H., and G. Lindström, cyclotron with 225-cm pole diameter, Stockholm, **2567**
Attew, J. E., decade-multivibrator design, **1557**
Attree, V. H., differential voltmeter using temperature-limited diode, **3501**; precision alternating-voltage source, **3505**
Auerbach, A. A., and others, Binac digital computer, **1356**
Augenblick, H., with W. Sichak, tunable waveguide filters, **353, 1834**
Austin, P. A., and A. C. Bemis, 'bright band' in radar precipitation echoes, **680**
Avery, D. G., optical constants of PbS and PbTe in range 0·5–3μ, **1938**
Axon, P. E., mechanism of magnetic-tape recording, **2427**
Ayer, R. B., Th-W filaments in high-power transmitting valves, **2660**
Ayers, E. W., with C. J. Cameron, Medresco hearing aid, **2111**
Aynberg, A. A., with Ya. L. Al'pert, effects of ionosphere irregularities, **130**
d'Azambuja, M., with others, observations of solar eclipse, 25th Feb. 1952, **2785**

B

Babcock, W. E., characteristics of a.m. detectors, **483**
Bache, H., and F. A. Benson, glow-discharge voltage-regulator tubes, peak-noise characteristics of, **2930**, mean-noise characteristics of, **2931**
Bachman, C. H., H. Eubank and G. Hall, hollow cathode for positive-ion studies in c.r. tubes, **1172**
Bachman, W. S., damping of gramophone pickup arms, **1813**
Badoyannis, G. M., with L. A. Rosenthal, r.m.s. valve voltmeter, **3502**
Baer, K. H., with others, radio common-wave system of the Südwestfunk, **2618**; Ravensburg 2×20-kW broadcasting transmitter, **2644**
Bagge, E., and J. Christiansen, parallel-plate self-quenching counter, **3525**
Baguley, E., and F. B. Cope, pulse-echo test set for quality control of coaxial cables, **2266**
Bähring, H., magnetic beam-deflection systems, **2352**
Bailey, D. K., and others new kind of v.h.f. radio propagation over long distances, **2581**
Bailey, V. A., relativistic theory of electro-magneto-ionic waves, **105**
—— and others, resonance in gyro-interaction of radio waves, **3214**
Bailey, W. F., with others, N.T.S.C. compatible colour television, **1750**
Bailin, L. L., effect of discontinuity in circular guide on plane acoustic waves, **1495**
—— with others, radiation characteristics of turnstile aerial shielded by tube, **2996**
Bailitis, E., with H. H. Rust, linear magnetostrictive ultrasonic generators using crossed magnetic fields, **3308**
Bain, W. C., and others, ionospheric propagation of 16-kc/s waves over distances of about 540 km, **2871**
—— with R. N. Bracewell, explanation of radio propagation at 16 kc/s, **2804**
Baker, E. B., automatic recording of dielectric-constant variation with temperature, **191**
Baldwin, M. W., Jr, subjective tests of sharpness of additive colour pictures, **330**
Baldwin, W. O., negative feedback, **3051**
Ballantyne, N. Z., circuits using balitron valve, **2388**
Ballard, D.C., with D. D. Van Ormer, effects of screen tolerances on operating characteristics of aperture-mask tricolour kinescopes, **852**
Baltensperger, W., theory of impurity centres in Si, **972**
Balz, G., automatic control of volume contrast, **940**
Bamford, A. B., combined television and radio receiver, **1090**
Banbury, P. C., double-surface PbS transistor, **2653**
Bane, W. T., and J. S. Appleby, automatic control of electrical power, **3561**
Banerjee, B. K., with others, vertical propagation of e.m. waves in ionosphere, **243**
Banerjee, B. M., study of switching in multivibrator, **931**
—— and R. Roy, timebase circuit for precision ionospheric recorder, **2477**
Banerjee, S. S., R. R. Mehrotra and V. D. Rajan, scattering of radio waves in ionosphere, **779**
Banks, B. D., applications of Muirhead-Pametrada wave analyser Type D-489 in aircraft-engine research, **3181**
Baños, A., Jr, D. S. Saxon and L. L. Bailin, radiation characteristics of turnstile aerial shielded by tube, **2996**
Banthorpe, C. H., single-valve line-scan and h.v. generator, **1137**
Barber, C. R., A. Gridley and J. A. Hall, design for standard resistance coils, **2452**
Barbier, J. C., after-effect constant over total hysteresis range, **2237**
Barbier, M., equilibrium between insulator emitting secondary electrons, a space charge, and constant-potential enclosure, **2364**
Barbiere, D., calculation of current distribution of Tchebycheff arrays, **1211**, **(C)3002**
Bardeen, J., with others, effects of pressure and temperature on resistance of Ge p-n junctions, **1328**
Barducci, I., artificial ear for calibrating telephone receivers, **306**
Bareiss, M., new damping diode, **551**
Barkow, P., wide-band f.m. directional links, asymmetry of frequency swing in, **267**, linearity limits of discriminators for, **2329**
Barlow, H. M., relative power-carrying capacity of h.f. waveguides, **1196**; input-impedance characteristics of anti-resonance h.f. transmission lines, **2430**
Barnes, B. E., and R. D. Faulkner, mechanical design of aperture-mask tricolour kinescopes, **851**
Barnes, C., with others, reflection of pulse by spherical surface, **2682**
Barnes, M. H., with R. M. Barrett, automatic microwave-aerial wave-front plotter, **1380**
Barone, A., concentration of ultrasonic energy, **3309**
Baroody, E. M., theory of secondary-electron emission from metals, **107**, Wooldridge's, **110, 3409**
Barré, M., and K. Rawer, ionospheric observations near Adélie Land, **399, 1293**
Barrère, G., Xe-filled G-M counters, **2003**
Barrett, R. E., and R. T. Beyer, anomaly in ultrasonic absorption of solutions, **1806**
Barrett, R. M., etched sheets for microwave components, **2705**
—— and M. H. Barnes, automatic microwave-aerial wave-front plotter, **1380**
Bartels, J., daily variations of geomagnetic field, **670**
—— and J. Veldkamp, international data on magnetic disturbances, first quarter 1951, **124**, second quarter 1951, **1286**, third quarter 1951, **2501**, fourth quarter 1951, **2792**
Barthel, R., and A. W. Nolle, recording ultrasonic interferometer and applications, **1807**
Barthélemy, R., television scanning tube, **1755**
Bartlett, S. C., with others, investigation of interference from h.v. lines, **257**
Bartley, W. P., and J. E. White, alterations of characteristics of oxide-cathode valves, **(A)3599**
Baruch, J. J., thyratron as close-differential relay, **929**
Basseras, —, detection of f.m. waves, **2590**
Bateman, R., with others, new kind of v.h.f. radio propagation over long distances, **2581**
Bates, D. R., temperature of upper atmosphere, **988**
—— and H. S. W. Massey, negative-ion concentration in lower ionosphere, **983**, **2796**
Bates, L. F., Modern Magnetism, **(B)1277**
—— and G. W. Wilson, new Bitter patterns on Ni single crystal, **701**
Batschelet, E., numerical solution of boundary-value problems by means of elliptic partial differential equations, **3153**
Battell, W. J., with others, counting system for nucleonics, **610**
Bauer, B. B., transformer analogues of diaphragms, **1488**
Bauermeister, E., and W. Knöpfel, u.s.w. field strength predictions for mountainous terrain, **2584**
Baumann, E., Fischer eidophor large-screen projection system, **2350**
Baumgartner, H., difference between dielectric constants of free and clamped KH_2PO_4 crystals, **1339**
Baumgartner, W., with N. Schaetti, Li-Sb photocathodes, **858**; properties of Cs-Sb photocathodes at different temperatures, **2070**
—— with others, photoelectric effect in Cs-Ga, Cs-In and Cs-Tl photocathodes, **2069**
Baur, F., with T. Einsele, frequency dependence of magnetic after-effect in powder cores, **1326**
Bauss, H., and R. F. Boyer, random noise in dielectrics, **3478**
Bayet, M., u.h.f. excitation of gases, **1887**
Bazzard, G. H., with others, propagation of m-λ waves beyond horizon, **242**
Beadle, D. G., with C. G. Mayo, portable tone source for acoustic measurements, **1382**; direct measurement of reverberation time, **1817**
—— with D. E. L. Shorter, portable microphone amplifier with miniature valves, **946**
—— with others, equipment for acoustic measurements, **1681**
Beale, E. S. L., and R. Stansfield, Standard-Sunbury engine indicator Mark 6, **754**
Beanland, C. P., and F. I. Rickaby, Marconi s.s.b. receivers, Types HR92 and HR93, **2878**
de Beauclair, W., complex-number calculator, **1355**
Beaumariage, D. C., with others, magnetic amplifiers, transient response of, **(A)926**, analysis of transients in, **2133**
Bebb, A. H., integrating galvanometer, **3176**
Bechmann, R., transformation of third- and fourth-order tensors, **710**; thickness-shear-mode resonators using circular bevelled plates, **2544**
—— and P. L. Parsons, piezoelectric properties of partially plated square crystals, **704**; mechanical strength of piezoelectric crystals, **3142**
Beck, F. J., J. S. Kouvelites and L. W. McKeehan, magnetostrictive vibration of prolate spheroids, **1929**
Becker, E. W., and W. Walcher, defects in mass spectrometer due to space charge and magnetic-field saturation, **2290**
Becker, G. E., and D. A. Caswell, operation of 6-MeV linear electron accelerator, **221**
Becker, J. A., electron-microscope study of adsorption of W on W and Ba on W, **1077**
Becker, R., separating networks with series-resonance circuits as blocking elements, **2463**
Becker, W., triple splitting in ionosphere, **672**
—— and W. Dieminger, recombination coefficient of F_2 layer during Mögel-Dellinger effect, 19th Nov. 1949, **1295**
Bederson, B., and M. Silver, nonelectronic rectangular-wave generator, **2479**
Bedford, L., television camera tubes, **(D)522**
Béguin, C., pulse location of line irregularities, **1366**
Behling, H., calculation of limiting effect of ratio detector, **485**; design of wide-band amplifiers, **948**; sensitivity of dm-λ and cm-λ receivers using diode mixers, **1719**
Behr, A., and H. Siedentopf, review of solar observations, **2209**
Behr, K., and H. Norrby, portable field radio equipment SUF-21K, **2898**
Behrend, P., and K. Scheuermann, practical realization of positive reactance functions, **1366**
v. Békésy, G., d.c. potentials and energy balance of cochlear partition, **307**
Belevitch, V., Tchebycheff filters and amplifier networks, **1541**; synthesis of 2n-pole passive networks with prescribed distribution matrix, **1547**; theory of cut-off (Cowan) modulator with capacitor shunt, **2363**
Bell, D. A., balanced RC oscillator, 0·1–20 c/s, **82**; dual circuit of feedback amplifier, **1564**; ionospheric interaction in disturbed conditions, **2011**; effect of feedback on amplifier frequency response, **2482**, **(D)3386**
Bell, J., some aspects of electrical computing, **235**
Bell, J. F. W., admittance bridge for piezoelectric crystals, **1675**
Bell, R. L., induced grid noise and noise factor, **559**
Bellman, R., approximate expressions for exponential integral and error function, **2252**
Beson, A. E., with others, association of absorption and E_s ionization with aurora at high latitudes, **2511**
Belyaev, I. N., and others, dielectric properties of TiO_2, **1345**
Bemis, A. C., with P. A. Austin, 'bright band' in radar precipitation echoes, **680**
Benda, H., conductivity of CdS crystals irradiated by medium-energy electron beams, **1628**
Bengtson, L., with others, integrating amplifier for c.r.o. recording of magnetic flux, **2276**
Benham, T. A., ultrasonic wave analyser, **1962**
Benjamin, F., improvements in materials extend magnetic-amplifier applications, **2732**
Bennett, R. R., and A. S. Fulton, generation and measurement of low-frequency random noise, **1030**
Bennington, T. W., propagation of v.h.f. via sporadic-E clouds, **1084**; ionosphere review for 1951, **1605**
Benoit, E., paramagnetism of sulphides of Fe, **3139**
Benson, A. C., with others, variation with depth of geomagnetic field, **1596**
Benson, F. A., directional-coupler errors, **582**; characteristics of miniature voltage-regulator discharge tubes, **1772**; design of series-parallel valve voltage stabilizers, **2045**, **(D)2901**

—— and G. V. G. Lusher, pulse generator, cathode-coupled, **1244**, 3-valve, **1554**

—— with H. Bache, glow-discharge voltage-regulator tubes, peak-noise characteristics of, **2930**, mean-noise characteristics of, **2931**

Benson, K. B., and A. Ettlinger, iconoscopes and image orthicons as film pickup devices, **838**

Bentley, A. Y., K. A. Hoagland and H. W. Grossbohlin, self-focusing picture tube, **2919**

Bentley, G. P., industrial tri-stimulus colour matcher, **219**

Beranek, L. L., and others, assessment of speech-reinforcement systems, **572**

vand den Berg, C. J., with others, measurements of resistance variation with current for condensed Fe films at low temperatures, **2828**

Bergen, S. A., with J. R. Boundy, electronic process controller, **1386**

Bergstrand, E., check determination of velocity of light, **3396**

Bergtold, F., wide sound distribution from radiator groups, **308**

—— and S. Sawade, 'physiological volume-control' in broadcasting-reception, **486**

Berkner, L. V., with others, new kind of v.h.f. radio propagation over long distances, **2581**

Bernard, F., television in Sweden, **3575**

Bernard, M., electron-optics formulae, **1392**; electron lenses with grids, axial potential of, **1696**, Gaussian elements of, **1697**; potential model for study of 3-electrode e.s. lens, **2000**; equation for trajectories in electron mirror, **2307**; e.m. field in linear ion accelerators, **3199**, numerical calculation of, **3200**

—— with P. Grivet, Gaussian components in two-cylinder e.s. lens, **1393** **2302**; axial potential of 3-element e.s. lens, **2865**

Bernard, P., 11-year variation of horizontal component of earth's magnetic field, **2213**

Bernard, R., and F. Davoine, vacuum evaporation equipment with high pumping speed, **2240**

Bernard, —, with — Cordonnier, operation of broadcasting studios, and new S.F.R. equipment, **1113**

Berndt, W., transmitting aerials for u.s.w. broadcasting, **43**

Bernhart, J., applications of concept of acoustic spatial distortion, **3300**

Bertein, F., electron lens, low-power e.s., study of, **1389**, approximation method for trajectories in, **2299**, **3202**; determination of field on axis in electron optics, **2298**

Bertrand, R., with C. Guillaud, conductivity of semiconducting oxide mixtures, **2525**

Besson, R., new amplifier arrangement, **873**

Best, R. L., with R. R. Rathbone, pulse mixing unit, **1523**; multivibrator frequency divider, **1871**

Bettridge, B. R. A., Ge crystal valves, **1785**

de Beurs, P. H., with others, decade-counter valve for high counting rates, **3614**

Beurtheret, C., cooling of high-power valves by vaporization of water, **542**, **2874**

Bevan, P. A. T., and H. Page, Sutton Coldfield television station, **854**

Bever, R. S., and R. L. Sproull, dielectric constant of BaO, **157**

Beveridge, H. N., and W. W. Keith, piezoelectric transducers for ultrasonic delay lines, **2743**

Bewley, L. V., Travelling Waves on Transmission Systems, **(B)2125**

Beyer, R. T., bibliography of acoustics, **293**, **1487**, **1797**, **2406**, **2675**, **3298**

—— with R. E. Barrett, anomaly in ultrasonic absorption of solutions, [illegible]

—— with others, absorption of sound in fluids, **1504**

Bhatia, A. B., theory of conductivity of monovalent metals, **2488**

Bibl, K., and K. Rawer, contributions of D and E regions in measurements of ionospheric absorption, **985**

—— K. Rawer and E. Theissen, field strength of waves reflected by ionosphere, **2318**

—— with others, determination of collision frequencies in E and F regions, **987**

Bickford, R. G., and W. T. Moffet, photostimulator, **225**

Bierl, R., frequency response in magnetic recording and reproduction, **318**

Bigg, E. K., with N. R. Labrum, r.f. oscillations in low-pressure discharge tubes, **3064**

Biggar, H. P., application of matrices to network problems, **617**

Biggs, B. S., deterioration of organic-polymer materials, **1020**

Biguenet, C., resistance through oxide-cathode layer, **2381**

Billig, E., calculation of magnetic field of conductors in closed slot, and application to transformer, **602**, **2448**; temperature effect on contact resistance of rectifiers, **706**; structure of Se, **2540**

Biondi, M. A., microwave measurement of electron density in ionized gases, **653**; mechanism of electron-ion recombination, **962**

—— and T. Holstein, mechanism of electron-ion recombination, **658**

Bird, R., measurement of microphony, **1773**

Birebent, R., device for measuring magnetic field strength, **2555**

Birnbaum, G., dielectric constant of water vapour in the microwave region, **2269**

Bittel, H., characteristics of noise and noise voltages, **3161**

Bjornson, G. A., graphical synthesis of networks for a.c. servos, **(A)501**

Blachman, N. M., forced betatron oscillation in synchrotron with straight sections, **761**

Black, H. S., C. O. Mallinckrodt and S. P. Morgan, Jr, experimental verification of theory of laminated conductors, **2988**

Blackband, W. T., sweep-frequency response of RG-6U cable, **3168**

Blackman, M., self magnetic field in high-current discharges, **1889**

—— with others, coil system for air-cored betatron, **2566**

van Bladel, J., field expansion in normal modes for multilayered waveguide, **2993**

Bladier, B., 4-channel oscillograph, **738**; reduction of background noise in amplifiers for encephalography, **2483**

Blaha, F., Rochelle-salt specimens moulded under high pressure, **1639**

Blake, F. G., Jr, spherical-wave propagation in solid media, **2410**

Blakemore, J. S., carrier concentrations and Fermi levels in semiconductors, **2001**

Blanc-Lapierre, A., statistics of background noise, **796**; interpolation theorem and aleatory functions, **2837**

—— M. Perrot and J. P. David, properties of thin films of Ag, Al and Si, **2587**

—— M. Perrot and N. Nifontoff, thin carbon films, conductivity of, 171, flicker effect in, **341**

Blaquière, A., Nyquist's theory and nonlinear oscillators, **335**; theory of RC and RL oscillators, **1867**; background noise in valve-maintained oscillators, effect on amplitude, **2162**, effect on frequency, **2163**, **2496**; representation of oscillator synchronization by nonlinear equations, **2735**

Blechschmidt, E., precision bridge for time constants of resistors, **3180**

Blet, G., theory of response of barrier-layer photocells, **3273**

Bloch, H., s.s.b. equipment and high-speed cyclic telemetry for carrier-current operation on h.v. lines, **801**

Blum, E. J., J. F. Denisse and J. L. Steinberg, ellipsoidal form of sun at metre wavelengths, **2786**

—— with others, observation of solar eclipse, 1st Sept. 1951, **1282**

Bocciarelli, C. V., low-power deflection for wide-angle c.r. tubes, **3581**

Bochirol, L., resistivity of ferrites as function of temperature, **1322**

Bodle, R. R., Cheltenham 3-hour-range indices *K*, for April–June 1951, **125**, for July–Sept. 1951, **1287**, for Oct.–Dec. 1951, **2502**, for Jan.–March 1952, **2790**

Boff, A. F., power meter and mismatch indicator, **449**; narrow-band transmission of teleprinter signals, **2893**

Bogatyrew, O. M., forced oscillations due to periodic e.m.f. of arbitrary waveform, **77**

Boggs, G. E., improvement in gain stability of superheterodyne mixer by application of negative feedback, **2018**

—— with S. Rubin, Type 6BN6 valve as mixer, **794**

Bohm, D., and T. Staver, application of collective treatment of electron vibrations to theory of conductivity, **1576**

Bohn, M., betatron and its applications, **1995**

Böhse, J., rectification of a.c. with high modulation, **1744**

Bolinder, F., Fourier transforms in theory of inhomogeneous transmission lines, **1830**

Bolljahn, J. T., and J. V. N. Granger, use of complementary slots in aircraft-aerial impedance measurements on models, **594**

Bolt, R. H., with U. Ingard, absorption characteristics of acoustic material, **311**, free-field method of measuring, **309**

Boltaks, B. I., F. I. Vasenin and A. E. Salunina, properties of blue TiO_2, **1644**

Bolton, J. G., and K. C. Westfold, distribution of radio stars in the galaxy, **1905**

Bomke, H., and J. Gefahrt, Einführung in die Theorie der Ausbreitung elektromagnetischer Wellen in Leitungen und Hohlkabeln, **(B)1843**

Bond, D. S., F. H. Nicoll and D. G. Moore, development and operation of a line-screen colour kinescope, **848**

Bond, W. L., with others, elastic constants of Si single crystals, **1014**

Bondi, H., and T. Gold, is there an aether?, **(D)2203**

Bonfiglioli, G., properties of plane inhomogeneous e.m. waves, **118**

—— and G. Montalenti, stabilized mains-supplied valve electrometer circuit, **1669**

Bonhomme, M., ionodyne receiver circuit, **1094**; Ionophone loudspeaker, **898**

Bonhomme, —, and — Droin, F.R.B. servo-gauge, **3188**

Bonifas, H., calculation of potential distribution in diode, **1162**; calculation of potential distribution and I/V_a curve for diode, **2084**; physical mechanism of charge in solid dielectrics, **3058**

Böning, P., measurement of high alternating voltages with capacitive voltage dividers, **440**, **2845**

Booker, H. G., with others, new kind of v.h.f. radio propagation over long distances, **2581**

Booth, A. H., and H. E. Buckley, growth rates of single crystals of EDT, **2543**

Boothroyd, A. R., design of filters with aid of electrolyte tank, **622**

Booton, R. C., Jr, optimization theory for time-variable linear systems, **3022**

Bordewijk, J. L., extension of reciprocity concept to valve circuits, **346**

Borel, J. P., thickness and temperature variation of resistivity of thin Ag films, **693**, **694**

Borg, H., pulsed circuits, transmission function and isomorphic transmission, **2466**

Borgnis, F. E., theory of fixed-path acoustic interferometer, **1808**

Borondo, M., consol radio-beacon system, **147**

Bosinelli, F., separation of degenerate modes in perturbed rectangular cavities, **79**

Bosse, G., dynamic transfer parameters of quadripole in f.m., **349**; dynamic characteristics of frequency detectors, **484**; ladder filters with attenuation fluctuations in pass band, **1543**

Bossi, H., function of lightning arresters, **509**

Bosson, F., and others, observation of solar eclipse, 1st Sept. 1951, **1282**

Botden, P. J. M., with B. Combée, special X-ray tubes, **1175**

Botden, T. P. J., transfer and transport of energy by resonance processes in luminescent solids, **1882**

Böttcher, F., nonlinear distortion in push-pull class-B amplifiers with choke output, **90**

Bottom, V. E., Hall effect and resistivity of Te, **3129**

Boucke, H., f.m. of transmitters by means of premagnetized h.f. iron-cored coil, **536**

Bouma, B. C., with W. C. van Geel, unforming of electrolytic and barrier-layer rectifiers, **2042**

Boundy, J. R., and S. A. Bergen, electronic process controller, **1386**

Bourion, R., Volta effect, **1885**, measurement of, **3164**

Bourne, B. E., with D. W. R. McKinley, accurate radio time-signal system, **1363**

Bouvier, P., and B. Daugny, hysteresis meter for measurements on pulse-transformer laminations, **197**

Bowers, G., chart for RC coupling networks, **3021**

Bowie, R. M., and B. F. Tyson, N.T.S.C. colour-television transmission system, **2343**

Bowker, I. H., audio problems in aircraft communication, **1187**

Bowles, K., fading rate of 50-Mc/s signals reflected from aurora borealis, **2876**

Boyd, R. L. F., mechanism of positive-ion collection by spherical probe in gas discharge, **957**

Boyer, R. F., with H. Bauss, random noise in dielectrics, **3478**

Bozorth, R. M., Ferromagnetism, **(B)666**

—— W. P. Mason and H. J. McSkimin, frequency and magnetic-field dependence of elastic constants of and losses in Ni, **887**

Braak, D. J., mobile radio equipment Type SRR 178, **2035**

Bracewell, R. N., radio stars or radio nebulae?, **2214**; theory of formation of ionospheric layer below E layer, **2797**; ionospheric propagation of 16-kc/s waves over 200-km paths, **2870**

—— and W. C. Bain, explanation of radio propagation at 16 kc/s, **2804**

—— with others, ionospheric propagation of 16-kc/s waves over 540-km paths, **2871**

Bradley, F. R., and R. McCoy, driftless d.c. amplifier, **1877**

Bramley, E. N., with R. Naismith, time-delay measurements at medium frequencies, **473**, **(D)1714**

Bramslev, G., 100-kW medium-wave transmitter at Kalundborg, Denmark, **1736**; broadcasting station at Skive, Denmark, **1736**

Brand, F., with others, secondary emission from composite surfaces, **2198**

Branson, N. G., ultrasonic measurement of metal-wall thickness, **455**

Brattain, W. H., theory of Cu_2O rectifier, **1121**

Bray, W. J., travelling-wave valve as microwave phase modulator and frequency changer, **1463**; detection of unlicensed television receiver, **3579**

Bréant, P., and G. Fuchs, television transmission tests on coaxial cables, **1439**

Bredt, I., with others, ionization and luminescence of flames, **657**

Breitling, W., graphical determination of optimum working point of permanent-magnet systems, **3462**

Brekhovskikh, L. M., diffraction of sound waves at uneven surface, **1181**; theory of displacement of rays in total internal reflection, **2770**

Bremmer, H., discontinuous solutions of wave equation, **1708**; derivation of paraxial constants of electron lenses, **3519**

Bressi, A., and G. G. Sacerdote, acoustic absorption of porous material, **12**

Brewer, A. W., J. Squires and H. McG. Ross, developments in electronic magnetometers, **1657**

Bridgewater, T. H., Paris-London television, **3572**

Briggs, B. H., collision frequency of electrons in ionosphere, **398**

Brillouin, J., radiation problems in acoustics of buildings, **2972**

Brillouin, L., information theory and most efficient codings for communication or memory devices, **1099**

Brimley, K. J., with J. McAuslan, dekatron timer, **3485**

Brinkley, J. R., v.h.f. broadcasting, case for a.m. in, **2026**, American experience in, **2899**

Bristeau, P., small-size h.v. battery, **1437**

Broadway, L. F., c.r. tubes, review of progress, **1788**

Broch-Toniolo, F., 2-terminal reactance-valve networks, **3025**

Brockman, F. G., structure and properties of ferrites, **168**; ferroxdure, **3460**

Brodin, J., linear networks with time-variable lumped parameters, **1538**; stability and parametric continuity of linear servomechanism, [illegible]

Broersma, C. B., developments in shipboard radar, **3089**

de Broglie, L., La Cybernétique—Théorie du Signal et de l'Information, **(B)**[illegible]

Bronzi, G., characteristics of f.m. with reactance valves, **535**

Brooker, R. A., solution of algebraic equations on EDSAC, **3155**

Brooks, F. E., Jr, and H. W. Smith, computer for correlation functions, **2547**

Broomall, J., and L. Riebman, sampling analogue computer, **2546**

Brophy, J. J., secondary-emission, comparison of theories of, **106**, from liquid metal surfaces, **109**

Broten, N. W., heater-voltage variation compensation in a.c. amplifiers, **2761**

Brown, D. E., with W. C. Dunlap, Jr, *p-n* junction method for measurement of diffusion in Ge, **3134**

Brown, J. N., with J. M. Watts, effects of ionospheric disturbances on l.f. propagation, **946**

Brown, R. H., and C. Hazard, radio emission, from Andromeda nebula, **1285**, from Cygnus region, **1904**, extra-galactic, **2215**

Brown, S. C., h.f. breakdown in gases, **958**

—— and D. J. Rose, properties of ionized gases at h.f., measurement of *Q*, **3496**

—— with D. J. Rose, properties of ionized gases at h.f.,measurement of electric field, **3489**

Brown, T. T., abac for temperature-compensation capacitors in parallel, **345**; design of miniature filter-transformer, **2749**

Bruene, W. B., simplified design of r.f. coupling units, **1857**

Bruining, H., television camera tubes, **1450**

—— with others, image iconoscope, **1754**, e.s. electron-optical system with only one voltage, **3284**

Brunner, F., transient processes in linear quadripoles, **2146**

Bubb, F. W., Jr, circuit for generating polynomials and finding their zeros, **1025**

Bube, R. H., photoconductivity and luminescence of ZnS, **150**

Buch, K. R., with N. Arley, Introduction to the Theory of Probability and Statistics, **(B)1861**

Buchanan, T. J., balance methods for cm-wave measurements of permittivity, **1663**; frequency spectrum of pulled oscillator, **3043**

Bucher, F. X., with F. J. Lundburg, cage-type v.h.f. phase-comparison omnidirectional-radio-range aerial, **3097**

Buchholz, H., loop-excited double-paraboloid cavity resonator, **2159**; laws of propagation of e.m. waves in conical horn, **3356**

Buchmann, G., and K. Küpfmüller, progress in development of electrodynamic loudspeakers, **19**

Buckland, B. O., valve heat-transfer data, **1774**

Buckley, H. E., with A. H. Booth, growth rates of single crystals of EDT, **2543**

Budden, K. G., reflection of very-low-frequency waves at sharply bounded ionosphere, **786**

—— and G. G. Yates, search for radio echoes of long delay, **3079**

Buehler, E., with others, single-crystal Ge, **3135**, elastic constants of, **1014**

Bugard, P., biological effect of high-level complex ultrasonic noise, **2416**

—— M. Guennec and J. Selz, sonic and ultrasonic noise in engineering and aviation, **2102**

Bull, C. S., space-charge smoothing factor, **(D) 1163**

Bulla, W., value of h.f. measurements on lightning-protection earths, **3188**

Bünemann, D., and H. Pethke, applications of f.m. pulse trains, **3589**

Bunimovich, V. I., fluctuation noise, voltage peaks of, **1419**, observed groups of peaks of, **1420**

Bunting, E. N., and others, properties of $Be/BaTiO_3$ dielectrics, **708**

Bura, P., and D. M. Tombs, resonant circuit with periodically varying parameters, **2471**, **(D)2756**

Bureau, R., and J. J. Vaury, recording of atmospherics in the *Commandant Charcot*, 1950-1951, **1305**

Burfoot, J. C., ray-tracing in electron lenses, **2303**

van den Burg, F., with A. N. Gerritsen, amplifiers for low-temperature operation, **1875**

Burgess, R. E., valve-voltmeter measurement of fluctuation noise, **189**; response of diode voltmeter to randomly recurrent impulses, **736**, **(C)1670**; slideback and infinite-impedance voltmeters, **1672**

—— and C. S. Fowler, solar activity and ionospheric effects, May–Nov 1948, **1715**

Burkard, O., tidal effect in the ionosphere, **402**; F_2 ionization, 'isanomalies' of, **1296**, half-year period in, **1602**

Burkhard, M. D., with others, acoustic characteristics of jet-edge systems, **2681**

Burkhardtsmaier, W., development problems of television transmitters, **2054**

Burkowitz, P., auditory-psychological acoustics, **2419**

Burlando, F., electronic equipment for telecontrol in h.v. networks, **466**

Burlock, J., self-adjusting timer for bullet photography, **1384**

Burnam, T. D., with R. W. Kenworthy, absorption coefficients of fir plywood penals, **310**

Burns, L. L. Jr, band-pass mechanical filter for 100 kc/s, **2752**

Burr, R. P., W. R. Stone and R. O. Noyer, test-pattern generator for colour television, **519**

Burridge, G. E., and A. S. Jong, coordination of power-line carrier-network, **(A)1102**

Burrow, J. H., and E. W. J. Mitchell, two modifications to ionization gauge, **2229**

Burrows, W. H., construction of 3-dimensional nomograms, **714**

Burton, R. F., trends in hearing-aid design and technique, **2983**

Burwen, R. S., equivalent circuits in feedback-amplifier design, **1565**

Busser, J., with others, quarter-square multiplier for analogue computer, **1022**

Butcher, F. E., and R. Willheim, magnetic-amplifier technique, **1849**

Butler, F., LCR phase-shift oscillators, **3382**

Butts, R. S., miniature radar responder beacon, **418**

Byram, E. T., with others, rocket measurements of solar X rays and extreme-ultraviolet light, **976**

Byrne, E. C., with others, association of absorption and E_s ionization with aurora at high latitudes, **2511**

C

Cabessa, R., radio beam links in telecommunications, **2610**

Cage, J. M., Theory and Application of Industrial Electronics, **(B)1401**

Cahen, G., electrical analogues of motor-car suspension systems, **(D)2563**

Cahour, P., with others, 5-kW wide-band klystron amplifier, **557**

Calaora, A., with others, absolute method of calibrating microphones, **2690**

Calbick, C. J., inorganic-replica technique in electron microscopy, **1071**

Caldecourt, V. J., with L. A. Matheson, charge storage in polystyrene-film capacitors, **932**

van Calker, J., and R. Arnold, thermal conductivity of electrets, **3443**

Callaghan, J. D., with E. O. Johnson, aerials for u.h.f. television reception, **1517**, **1840**

Callahan, L. G., with L. M. Ornnan, $BaTiO_3$ delay lines, **1231**

Callahan, R. C., and others, electrical conductivity of air in troposphere, **1289**

Callaway, D. B., and L. G. Ramer, perforated facings in low-frequency resonant absorbers, **2697**

Callick, E. B., low-power c.w. magnetrons with few segments, **2950**

Calvert, J. F., with J. P. Corbett, analogue computer for mechanical structures, **1023**

Cambornac, M., and F. Lajeunesse, stabilization of d.c. servomechanisms, **1738**

Cameron, C. J., and E. W. Ayers, Medresco hearing aid, **2111**

Campbell, J., 100-W and 150-W transmitters for m.f., h.f. and v.h.f. bands, **2064**

Campet, H., and S. Odartchenko, 150-kW medium-wave broadcasting transmitter, **3588**

Camras, M., new magnetic-recording head, **2110**

Canac, F., acoustics of ancient theatres, **565**

—— and V. Gavreau, ultrasonics in air, **6**

Cannon, C. G., with H. A. Gebbie, optical properties of amorphous Se, **3128**

Caplan, D., and E. Akeley, axial motion of electron in linear accelerator, **3518**

Cardot, C., application of Boole's algebra to relay circuits, **2135**

Carleton, J. T., small-scale analogue computer, **1024**

—— with E. L. Harder, new techniques on Anacom computer, **2255**

Carlevaro, M., investigation of e.m. wave propagation by means of models, **470**

Carlin, J. H., and M. Sucher, accuracy of bolometric power measurements, **3511**

Caro, D. E., theory of phonic motor, **3564**

Carr, E. F., with others, radiation resistance of resonant transmission lines, **2987**

Carr, W. J., and R. Smoluchowski, magnetostriction of single crystals of Fe/Si alloys, **1012**

Carrara, N., refraction of evanescent waves, **34**; report of Study Centre for microwave physics, Florence, for 1950, **881**, for 1951, **3396**

Carroll, J. M., U.S. Navy primary-standard frequency meter, **1378**; C.R.P.L. automatic ionosphere recorder, **1918**

Carter, A. H., and A. O. Williams, Jr, expansion for velocity potential of piston source, **(C)2412**

Carter, J. L., with others, single- and multi-iris resonant structures, **2708**

Carter, W. R., with D. G. Kiely, fading of 3-cm waves over 10·6-mile sea path, **2717**

Cary, R. H. J., slot aerial and application to aircraft, **2724**; survey of external and suppressed aircraft aerials for h.f., **2725**

Casey, J. P., Jr, with E. A. Lewis, reflection and transmission by resistive gratings, **3057**

Castell, V., phototelegraphy by wire, **818**

Castellini, N. R., noise figure of magnetic amplifier, **994**

Caswell, D. A., with G. E. Becker, operation of 6-MeV linear electron accelerator, **221**

Caton, P. G. F., and E. T. Pierce, waveforms of atmospherics, [illegible]

Cauer, W., h.f. amplifier circuits with narrow pass band, **98**

Cawein, M., with E. E. Harries, concentric-line u.h.f. tuning unit, **1759**

Cazenave, R., signal distortion by homogeneous coaxial line, **1194**, **(C)3336**

Chait, H. N., with others, microwave-aerial ferrite applications, **2721**

Chalmers, J. A., relation between point-discharge current and field, **3085**; point-discharge currents, **3086**

Chambers, L. G., propagation constants of inhomogeneously filled waveguide, **2114**; sharpness of aerial-beam cut-off, **3357**

Champion, F. C., counting properties of diamonds, **3526**

—— with R. Stratton, counting response of two large diamonds under

β-irradiation, 3527
Champion, K. S. W., theory of gaseous arcs, **3066, 3067**
Chance, B., and others, quarter-square multiplier for analogue computer, **1022**
Chandler, D. P., with others, transient response of magnetic amplifiers, **(A)926**
Chaney, J. G., critical study of circuit concept **1854**
Chang, Han, R. C. Lathrop and V. C. Rideout, study of oscillator circuits by analogue-computer methods, **943**
Chang, K. K. N., with J. S. Donal, Jr, injection locking of magnetrons used in a.m. transmitters, **3047**
Chang, Sing, and Chu Yao-I, new multivibrators, **2758**
Chanson, P., and C. Magnan, first results with a proton microscope, **2002**
Chapin, E. W., and W. K. Roberts, reduction of TV receiver oscillator radiation, **3264**
Chaplin, G. B. B., c.r.o. display of transistor characteristics, **3184**
Chapman, J. K., vertical nonrotating directional aerial system, **595**
Chapman, S., phenomena of upper atmosphere, **1291**; equatorial electrojet, **1597**; earth's magnetism and its changes, **2499**; probable error of determinations of lunar daily variations of geophysical data, **(D)2801**
Charles, D., electron multiplication and its applications, **2368, 3602**
Chasmar, R. P., and others, sealing sapphire to glass for photocells, **179**
Chasson, R. L., with M. L. MacKnight, construction of external-cathode G-M counters, **1078**
Chatterjee, S. D., with G. Ensell, circular G-M counter, **1079**
Chatterjee, S. K., cavity-resonator measurement of u.h.f. dielectric loss, **3162**
Chavance, P., cm-wave propagation in northern France, **3218**
—— and L. Moutte, impedance matching of travelling-wave valve Type M8 to waveguide, **2940**
Chavasse, P., and R. Lehmann, noise abatement in offices of Administration française des P.T.T., **1816**; standardization of hearing aids and test methods, **3335**
Cheatham, T. P., Jr, with others, application of correlation analysis to detection of periodic signals in noise, **(D)479**
Cheek, R. C., application of microwave channels, **266**
Cheeseman, I. C., long-wave absorption of insulating crystals, **2181**
Cheng, D. K., reproduction of pulses, **3007**
Chenot, M., 'pile' constituted by gas ionized at h.f., **2189**
Cherry, E. C., theorems for nonlinear systems with reactance, **1227**; history of theory of information, **258**
Chester, W., reflection of transient sound pulse by parabolic cylinder or paraboloid, **3307**
Chesterman, W. D., The Photographic Study of Rapid Events, **(B)2049**
Chestnut, H., and R. Mayer, Servomechanisms and Regulating System Design, **(B)816**; stability and accuracy of servomechanisms, **2038**
Chetaev, D. N., with B. L. Rozhdestvenski, elimination of reflections in waveguides with varying cross-section, **1832**
Chia-Chuh, Yang. See Yang, Chia-Chuh.
Chick, D. R., and D. P. R. Petrie, helix as linear accelerator for protons, **1694**
Child, M. R., growth and properties of cathode interface layers in receiving valves, **2378**
—— with others, life of oxide cathodes in receiving valves, **1781**
Chinnock, E. L., portable direct-reading microwave noise generator, **1986**
Chipman, R. A., and others, radiation resistance of resonant transmission lines, **2987**
Chipp, R. D., blue lamp for television studio, **836**
Chippendale, R. A., with J. A. Jenkins, image-converter tubes, application to high-speed photography, **1693**, applications of, **2864**
Chireix, H., u.h.f. multiplex R/T links, **496**
Chirnside, R. C., and H. J. Cluley, Ge from flue dust, **3136**
Chodorow, M., and V. B. Westburg, space-charge effects in reflex klystrons, **1177**
Choudhury, A., absorption of u.h.f. waves by opalescent binary liquid mixtures, **2492**
Choudhury, D. C., vertical transport of ions by solar tides in F_2 region, **2799**
Chrétien, L., 'ion-spot' problem in television, **840**; supply problems at a.f., **3570**
Christensen, J. W., with others, U.S.A. standard on colour television, **831, 1447**
Christensen, L., 24-channel p.m. microwave telephony equipment, **1107**
Christensen, P., transmitters for international shared frequencies and new Danish f.m. stations, **1736**
Christiansen, J., with E. Bagge, parallel-plate self-quenching counter, **3525**
Christiansen, L., cubic distortion in ring modulator, **1874**
Chu, Yao-I, with Chang Sing, new multivibrators, **2758**
Chynoweth, A. G., diamond counters, space charge in, **281**, space-charge-free, **282**
Cioffi, P. P., recording fluxmeter, **3174**
Clancy, E. P., polarization effects in photomultiplier tubes, **3270**
Clarence, N. D., and D. J. Malan, magnetic-tape recording of e.s. field changes, **190**
Clarke, C., and D. E. Mortimer, automatic atmospherics-waveform recorder, **679**
Clarke, G. M., symbolism for microwave-valve classification, **(A)2658, 3598**
Clarkson, L. S., stratospheric circulation between polar and equatorial regions, **1600**
Classen, R., F. W. Gundlach and F. Lentze, single-beam c.r.o. for simultaneous display of several phenomena, **1044**
Clayton, R. J., and others, London/Birmingham television radio-relay link, **820**
Clegg, J. A., and R. L. Closs, plasma oscillations in meteor trails, **655**
Cleland, J. W., and others, neutron bombardment of Ge, effect of, **163**, production of hole traps by, **1637**
Closs, R. L., with J. A. Clegg, plasma oscillations in meteor trails, **655**
—— with T. R. Kaiser, theory of reflection from meteor trails, **2208**
Clostre, P., and R. Wallauschek, signal generator for measurements at u.h.f., **2862**; travelling-wave valves Types M8 and M11, measurements and characteristics for, **2931**, impedance matching to coaxial lines, **2939**
Cluley, H. J., with R. C. Chirnside, Ge from flue dust, **3136**
Clune, R. R., miniature high-capacity dry cells, **2048**
Cocking, W. T., 'efficiency' line-scan circuits, **527, 2916**; ringing-choke h.v. systems, **1140**
Codelupi, R., application of operational calculus to transients on transmission lines, **2112**
Codier, E., with J. Rabinow, gramophone needle-drag distortion, **2423**
Cohen, G. H., nonlinear-circuit analysis, **(C)613**
Cohen, H., with D. T. Laird, acoustic radiation patterns for finite source on rigid cylinder, **1800**
Cohen, M. H., origin of ferroelectric properties of $BaTiO_3$, **1340**
Cohen, N. L., with L. Goldstein, gas-discharge plasma in h.f. e.m. field, **1088**
Cohen, S. B., analysis and design of self-saturable magnetic amplifiers, **337**
Cohn, J., use of klystrons in f.m. microwave links, **2895**
Cohn, S. B., electrolyte-tank measurements of aperture parameters, **725, (C)1365, 3490**; microwave coupling by large apertures, **2473**
Colberg, R., charging of secondary-emission surfaces, **2348**
Cole, F. G., with D. E. Garrett, general-purpose electronic wattmeter, 0–71 kc/s, 0–50 W, **1982**
Coleman, J. H., with others, h.v. cold-cathode rectifier, **2927**
Coles, B. R., structure and properties of Ni-Cu and Pd-Ag alloys, **2542**
Colin, J. F., propagation of e.m. waves along metal surface with dielectric coating, **30**
Collatz, L., numerical determination of periodic solutions for nonlinear oscillations, **3154**
Collinge, B., and T. N. Marsham, a.c. stabilizer, **2046**
Colombani, A., h.f. mutual inductance of wire and portion of parallel conducting plate, **1581**
—— and G. Ranc, influence of support on crystallization of thin gold films, **172**
Comar, C. L., with others, sensitivities of windowless and end-window counters, **1397**
Combée, B., and P. J. M. Botden, special X-ray tubes, **1175**
Conner, J. A., r.f. standard capacitors for minute increments, **159**
Conrad, F., standard frequencies and standard time of Funkamt, Berlin, Jan. and Feb. 1952, **2548**
Convert, G., calculation of fluctuation noise in electron beams without transverse magnetic field, **2397**
Cook, E. D., and H. R. Summerhayes, Jr, supervisory instrument for broadcast stations, **807**
Cook, H. F., dielectric behaviour of water in water-dioxan mixtures, **695**, dielectric constant of blood at u.h.f., **749**; dielectric properties of human tissue at microwave frequencies, **1385**
—— with J. E. Roberts, microwaves in medical and biological research, **2292**
Cooke, D., self-interpolating crystal calibrator for r.f. measurement, **1964**
Cooke, S. F., with E. W. Fletcher, cathode-follower loudspeaker coupling, **947**
Cooke-Yarborough, E. H., counting random pulses, **928**
Coolidge, A. W., Jr, Type GL-5855 high-current thyratron, **874**
Coop, E., with R. E. Hall, components for instruments, **1865**
Cooper, R., breakdown in Se rectifiers, **3568**
—— and J. Harrington, positive-current creep in Se rectifiers, **2832**
Cooper, V. J., negative-feedback amplifiers with specified amplitude/frequency characteristics, **642**; new amplifier techniques, **3582**
Cope, A. D., with P. K. Weimer, photoconductivity in amorphous Se, **1006**
—— with others, properties of photoconductors, particularly Sb_2S_3, **1008**
Cope, F. B., with E. Baguley, pulse-echo test set for quality control of coaxial cables, **2266**
Cope, J. E., and R. Theile, impedance changes in image iconoscopes, **521**
—— L. W. Germany and R. Theile, improvements in image-iconoscope-type tubes, **2632**
Copeland, P. L., and D. N. Eggenberger, electric field and transit time as functions of diode current, **2382**
Coppola, P. P., with others, chemical reactions in BaO-on-W emitters, **3279**
Copson, E. T., transport of discontinuities in e.m. field, **1709**
Coquillion, J., pyralene-impregnated-paper capacitors, **3020**
Corbett, J. P., and J. F. Calvert, analogue computer for mechanical structures, **1023**
Corbyn, D. B., special rectifier circuits, **3565**
Cordonnier, —, and — Bernard, operation of broadcasting studios, and new S.F.R. equipment, **1113**
Cork, E. C., vestigial-sideband filter for Sutton Coldfield station, **626**
Corkum, R. W., isotropic artificial dielectrics, **2523**
Cormack, A., wide-range variable-frequency oscillator, **359**; distributed amplification, **2167, (D)2760**
Cornell, J. A., and J. F. Sterner, sweep-frequency generator for u.h.f. television band, **2285**
Coroniti, S. C., with others, electrical conductivity of air in troposphere, **1289**
Corrington, M. S., and M. C. Kidd, amplitude and phase measurements on loudspeaker cones, **312**
Corsain, G., with A. Moles, detector of transients in music and speech signals, **2417**
Cosgriff, R. L., and E. H. Gamble, automatic control of inaccessible terminal voltages, **1062**
Cosslett, V. E., conferences on electron microscopy, Washington and Philadelphia 1951, **3206**
Costas, J. P., coding with linear systems, **3547**
Cotellessa, R. F., with others, colour television system for industry **(A)276**
Cottony, H. V., and J. R. Johler, cosmic radio-noise intensities in v.h.f. band, **3421**
Couchet, G., M. Gauzit and A. Septier, ion image of emissive anode, **1695**
Coulon, J., quartz crystal, equivalent-circuit parameters of, **2549, 3160**, plotting the resonance curve of, **2550**
Coulthard, W. B., Transients in Electrical Circuits, using the Heaviside Operational Calculus, **(B)2177**
Coursaget, J., moving-coil galvanometers with high voltage sensitivity, applications in biological physics, **2282**
Courtillot, E. P., conditions for development in France of 2-way v.h.f. R/T, **268**
Cowhig, W. T., with others, interaction of travelling magnetic fields with ionized gases, **2195**
Cownie, A., and L. S. Palmer, effect of moisture on permittivity of soil, **2793**
Cox, V. J., automatic circuit checker for radio receivers, **2860**
Craig, J. A., automatic r.f. repeater system in Cuba, **1106**
Crain, C. M., and D. P. Deam, airborne microwave refractometer, **3493**
—— and J. R. Gerhardt, measurement of parameters involved in theory of tropospheric radio scattering, **1411**
Cranberg, L., initiation of electrical breakdown in vacuum, **3065**
Crandall, S. H., relaxation method for eigenvalue problems, **1353**
Craston, J. L., with others, sealing sapphire to glass for photocells, **179**
Crater C. D., electrolytic capacitors at low temperatures, **2136**
Crawford, A. B., and W. C. Jakes, Jr, selective fading of microwaves, **1413**
Crawford, J. H., Jr, with others, neutron bombardment of Ge, effect of, **163**, production of hole traps by, **1637**
Creamer, A. S., with others, properties of Be/$BaTiO_3$ dielectrics, **708**
Critchley, O. H., and M. R. Gavin, transit-time oscillations in triodes, **2864**
Crosby, D. R., r.f. resistors with kilowatt ratings, **2451**
Crosby, E. L., Jr, series amplifier, **1247**
Cross, A., and F. R. Yardley, broadcasting and rediffusion systems for colonial territories, **2336**
Crowhurst, N. H., winding space determination, **605**; a.f. transformer design charts, **1216**; prediction of a.f. response, **1539, 1540, 2745, 2746**; resolution of complex quantities, **3359**
Cuker, S., with others, C.B.S.-Columbia combined colour and black-and-white television receiver, **1758**
Cullen, A. L., absolute power measurement at microwave frequencies, **1052, 2849, 2850**
Cumming, W. A., dielectric properties of ice and snow at 3·2-cm λ, **3494**
Cunningham, W. J., equivalences for analysis of circuits with small nonlinearities, **3026**; incandescent lamps in voltage stabilizers, **3243**
Curie, D., attempts to apply wave mechanics in theory of phosphorescence, **1880**; free paths of electrons in crystals, and related effects, **3408**
—— with N. Arpiarian, electron levels in phosphors with Fe, Ni or Co poison centres, **2232**
Curtis, H. W., measuring the mean power of complex a.f. waves, **2688**
Cusano, D. A., with others, transparent luminescent films, **685**
Cutler, C. C., calculation of travelling-wave-valve gain, **544**
Cutolo, M., R. Ferrero and M. Motzo, experimental determination of gyro-interaction resonance curve, **2010**

D

Dahlgren, F., theory and applications of wave vectors, **2250**
Dahlke, W., planar triode, effective grid potential and cathode-current density of, **2085**, calculation of families of characteristics for, **3609**
Dailey, H. J., and C. H. Scullin, application of valves in h.f. heating equipment, **757**
Dammann, H., with others, decay of $CaWO_4$ and ZnO phosphors after electron-beam excitation, **3442**
Dammers, B. G., and others, Electronic Valves, Book V—Application of the Electronic Valve in Radio Receivers and Amplifiers, Vol. 2—A.F. Amplification, the Output Stage, Power Supply, **(B)2765**
Daniel, J., with others, stability of control systems, **2619**
Daniels, H. L., boundary-displacement magnetic recording, **1963**
Danzin, A., working characteristics of ceramic capacitors, **85, 1222**
Darlington, S., network synthesis using Tchebycheff polynomials, **2742**
Darré, A., transient phenomena in sound transmission, **2407**
Das, P. M., and S. R. Khastgir, random fading of s.w. signals, **1088**
Dascotte, J., evaluation of signal/noise ratio for multiplex radio link, **2608**
Dash, W. C., with others, growth and manipulation of BaO crystals, **174**
Date, M., with others, permittivity and permeability of ferrites at 6·6-cm λ, **2585**
Daugny, B., with P. Bouvier, hysteresis meter for measurements on pulse-transformer laminations, **197**
Davenport, L. L., and others, dee-bias system for f.m. cyclotron, **763**
Davenport, P. A., with others, interaction of travelling magnetic fields with ionized gases, **2195**
Davenport, W. B., Jr, speech-wave probability distributions, **3314**
—— R. A. Johnson and D. Middleton, statistical errors in measurements of random time functions, **2843**
David, E. E., Jr, r.f. phase control in pulsed magnetrons, **2670**
David, J. P., with M. Perrot, effect of electric field on development of thin films, **2826**
—— with others, properties of thin films of Ag, Al and Si, **2537**
David, P., radio communication in French navy, **1116**
Davids, H. H., mobile radio equipment performance specifications, **745, (C)1985**
Davids, N., geometrical interpretation of II wave and coupling factor in ionospheric long-wave theory **1403**
—— E. G. Thurston and R. E. Mueser design of optimum directive acoustic arrays, **1799**
Davidson, D., r.f. time-delay measurements, **(D)1714**
Davidson, J. A. B., precision decade oscillator, 1 c/s–100 kc/s, **3512**
Davidson, R., r.f. characteristics of capacitors, **2740**
Davies, B. F., differential amplifier with useful modifications, **3392**
Davies, D. E., with F. L. Jones, secondary ionization in low-pressure breakdown in H, **102**
Davies, S., line strobe monitor for television waveforms, **2846**
Davies, I. L., reception of signals in noise, **1718**
—— with P. M. Woodward, information theory and inverse probability in telecommunication, **1724**
Davies, J. G., and J. S. Greenhow, summer daytime meteor streams of 1949 and 1950, **386**
—— with others, velocity distribution of sporadic meteors, **1899**
Davis, H. J., with others, loss of emission in oxide-cathode valves due to shock, **2863**
Davoine, F., with R. Bernard, vacuum evaporation equipment with high pumping speed, **2240**
Davy, N., and N. H. Langton, field inside semi-infinite slot with semi-cylindrical bottom, **3071**
Dawance, E., a colonial talks about tropicalization, **3145**
Dawes, C. L., C. H. Thomas and A. B. Drought, impulse measurements with repeated-structure networks, **2267**
Dayonnet, —, with — Andrieux, equipment for comparison of nearly equal frequencies, **1979**
De, M. L., illuminating system of electron microscope, **1073**
Deam, A. P., with C. M. Crain, airborne microwave refractometer, **3493**
Deards, S. R., matrix theory applied to valve circuits, **2744**
De Barr, A. E., magnetic materials and ferromagnetism, **689**
—— with others, magnetostriction storage system for digital computer, **1200**
De Baun, J. R., R. A. Monfort and A. A. Walsh, N.B.C. New York colour-television field-test studio, **2909**
Debiesse, J., and G. Neyret, study of valves by use of radioactive elements, **1782**
Decaux, B., recent developments in L.N.R. frequency-measurement department, **3159**
—— J. Lucas and V. Yanouchevsky, clock with rate the true arithmetic mean of rates of several clocks, **3158**
Decker, R. P., analysis of radio-propagation data, **784**
Defant, F., temperature profile in troposphere as affected by exchange processes and heat of condensation, **393**
Degoumois, C., overvoltage protection of electrical systems, **508**
Degras, D., thermocouple micromanometer, **3103**
Deighton, M. O., with others, millimicrosecond-pulse techniques, **2730**
Dekker, A. J., and A. van der Ziel, theory of production of secondary electrons in solids, **3069**
Delaby, H., Bases Techniques de la Télévision, **(B)1460**
DeLange, O. E., pulse investigation of microwave propagation, **1414**
Delcambe, J., measurement of radiation of u.s.w. aerials, **1519**
Delcroix, J. L., axial-anode magnetron in condition of static space charge, **877**; experimental study of magnetron in cut-off condition, **3620**
Delourmel, T., and A. Herpin, magnetostriction in rotating field, **384**
Demos, P. T., A. F. Kip and J. C. Slater, M.I.T. linear electron accelerator, **2295**
Denis, M., and H. Fovet, secondary-standard u.h.f. generator of the C.S.F., **1377**
Denisse, J. F., and Y. Rocard, excitation of electron oscillations in a shock wave, application to radio astronomy, **1900**
—— with others, observation of solar eclipse, 1st Sept. 1951, **1282**; ellipsoidal form of sun at metre wavelengths, **2786**
Dennis, S. C. R., with D. N. de G. Allen, relaxation methods in solution of boundary-value potential problems, **1354**
Derbyshire, A. G., with others, reverberation times of 10 British concert halls, **3320**
Deremer, K. R., with H. Johnson, gas-discharge u.h.f. noise sources, **185**
Deriaud, J. P., with A. Lovichi, crystalline structure and electroacoustic properties of magnetic tapes, **3334**
Déribéré, —, and J. C. Stern, electronic control of soldering temperatures using infrared radiation, **772**
Derr, V. E., and M. D. Earle, properties of powdered $BaTiO_3$, **2943**
Desauty, J., and R. Rocherolles, investigations of slot-aerial fields, **48**
Deschamps, J., and G. G. Esculier, practical design of parabolic microwave aerial, **2447**
Deutsch, S., Theory and Design of Television Receivers, **(B)1146**
Devonshire, A. F., theory of $BaTiO_3$, **1341**
DeVore, H. B., and J. W. Dewdney, photoconductivity and photoelectric emission of BaO, **149**
Dewar, D., seasonal changes in tropopause level and stratosphere temperature at Habbaniya, **1599**
Dewdney, J. W., with H.B. DeVore, photoconductivity and photoelectric emission of BaO, **149**
Dewey, G. C., P. Parzen and T. J. Marchese, periodic-waveguide travelling-wave amplifier for medium powers, **1153**
Dexter, D. L., and F. Seitz, effect of dislocations on mobilities in semiconductors, **349**
Dexter, J. F., silicone rubber as dielectric, **1644**
Diamond, J. M., shorted stubs with high resonance impedance, **1855**
Dickinson, A. H., with P. Adorian, h.f. broadcasting with vertical radiation, **2335**
Diehl, W. H., and C. J. Statt, frequency adjustment of mobile transmitters, **1034**
Diemer, G., and H. Dijkgraaf, Langmuir's ξ,η tables for exponential part of I_a/V_a characteristic, **2376**
—— and K. Rodenhuis, geometry of microwave amplifier valves, **2377**
—— Z. van Gelder and J. J. P. Valeton, interference effects on television pictures, **2641**
Dieminger, W., ionosphere echo sounding at oblique incidence, **674**
—— and A. E. Hoffmann-Heyden, reflection of short waves at heights <100 km, **2317**
—— with W. Becker, recombination coefficient of F_2 layer during Mögel-Dellinger effect, 19th Nov. 1949, **1295**
Diesselhorst, H., magnetic field and torque for magnetic ellipsoid in external field, **1271**
Diethelm, C. W., ferrites as magnetostrictive resonators and their use as filter elements, **624**
Dietrich, I., resistance of thin insulating TiO_2 layers, **3114**
Dijkgraaf, H., with G. Diemer, Langmuir's ξ,η tables for exponential part of I_a/V_a characteristic, **2376**
van Dijl, B., and D. van Sabben, radio propagation between New York and Amsterdam, **3213**
Dike, S. H., and D. D. King, gain and back-scattering cross-section of cylindrical aerial, **2716**
Dillenburger, W., television picture amplifier with negative feedback, **531**; Einführung in die neue deutsche Fernsehtechnik, **(B)533**
Dilley, J. E., with others, portable television pickup equipment, **2911**
Dingle, R. B., magnetic properties of metals, **2489, 2490**
Dirac, P. A. M., is there an aether?, **1573, (D)2993, (D)2769**; new classical theory of electrons, **1574, 3059**
Dishal, M., alignment of multiple-resonant-circuit filters, **627, 3038**
Dittler, H., with H. Gagel, materials for electrical contacts, **3146**
Doyen, L., with others, crosstalk in time-division-multiplex systems, **1104**
Dobrowsky, A., production of high direct voltage by charging mercury drops, **2047**
Dockés, J., waveguide diaphragms and filters, **3346**
Doehler, O., magnetron as travelling-wave valve, **289**
—— with others, transmission lines with periodic structure, **3615**; new u.h.f. oscillator valves with wide electronic tuning band, **3616**
Doetsch, G., with D. Voelker, Die zweidimensionale Laplace-Transformation, eine Einführung in ihre Anwendung zur Lösung von Randwertproblemen nebst Tabellen von Korrespondenzen, **(B)1360**
Donzelot, E., electronic correlator, **248**
Doran, T. J., electrically excited fatigue testing equipment, **750**
Dollfus, A., with others, observations of solar eclipse, 25th Feb. 1952, **2785**
Dome, R. B., frequency-spectrum utilization in colour television, **329**; N.T.S.C. colour television synchronizing signal, **1749**
Domin, P., synthetic insulating materials, **1349**
Donal, J. S., Jr, and K. K. N. Chang, injection locking of magnetrons

used in a.m. transmitters, **3047**
Donaner, E., calculation of small transformers, **606**
Dorf, R. H., with I. Kamen, TV Master Antenna Systems, **(B)2126**
Döring, H., and W. Klein, resonance-resistance measurements at cm λ, **1959**; cavity band-pass filters for cm waves, **2149**; applications of window coupling at cm λ, **2158**
Döring, W., force and torque on magnetized bodies in magnetic field, **1270**
Dormont, H., electronic temperature of oxide cathodes, **1471**
Dorn, J. E., with A. T. Robinson, effect of alloying elements on resistivity of Al alloys, **1646**
Dorrestein, R., with J. C. Francken, paraxial image formation in magnetic image iconoscope, **1753**
Doucet, Y., and J. P. Guignard, resistance of thermistors as function of temperature, **3062**
Douglas, P. E., with C. C. Eaglesfield, measurement of interface resistance and capacitance of oxide cathodes, **1661**
Douma, T. J., r.f. current transformers, **1847**
Dovey, D. M., and I. Jenkins, review of electric furnaces, **1387**
Dow, W. G., with H. A. Romanowitz, statistical and physical concepts of thyratron deionization time, **2387**
Dowd, J. J., optical properties of Se, **1013**
Dozois, E., with T. F. Hueter, frequency response of BaTiO$_3$ transducers, **1819**
Dranetz, A. I., with G. K. Guttwein, self-generating accelerometers, **748**
Dratz, M., with others, absolute method of calibrating microphones, **2890**
Drew, R. O., with others, compensation in television film reproduction, **1443**
Dreyer, H. J., photoelectric device for scanning curves, **1992**
Droin, —, with — Bonhomme, F.R.B. servo-gauge, **3188**
Drought, A. B., with others, impulse measurements with repeated-structure networks, **2267**
Druey, W., h.f. measurement technique, **1954, 3163**
Drummond, D. G., and G. Liebmann, St. Andrews conference on technique of electron microscopy, **1702, 2305**
Dubois, M., absorption of sonic and ultrasonic waves in gases, **1497**
Duchâteau, F., magnetic recording of sound, **1511**
Duchaussoy, M., and M. Guillaume, construction of scanning assembly for wide-angle flat-faced c.r. tube, **2637**
Dudding, R. W., Al-backed screens for c.r. tubes, **1455**
Duff, C. K., telemetry and communication systems for power system, **1063**
Dufour, C., conductivity of dielectric under electron bombardment, **1630**
Dugas, C., with others, semiconducting properties, of Te, **3450**, of molybdenite, **3454**
Duhautois, T., with N. Mostovetch, temperature and voltage variation of resistance of thin evaporated metallic films, **1634**
—— with others, variation of resistance of metal films with applied potential, **2192**
Dummer, G. W. A., electrolytic capacitors, **938**; engineering of radar equipment for R.A.F., **3091**
Dunbar, A. S., calculation of shaped-beam aerials, **923**
Dunlap, W. C., Jr, and D. E. Brown, *p-n* junction method for measurement of diffusion in Ge, **3134**
Dunn, A. F., with M. Romanowski, sensitivity of bridge networks, **3506**
Dunning, K. L., and R. G. Fellers, susceptance of thin iris in circular waveguide for TM$_{01}$ waves, **1513**
Dunoyer, L., metallization of surfaces by evaporation, **1334**
Durand, É., general solutions of equations of electrostatics and magnetostatics, **1262**
Durrance, G. A., W. J. D. Harrison and R. T. Lovelock, principles and practices in tropicalization, **176**
Dusailly, J., application of electronics to control of watches or clocks, **3195**
Dušan, V., new broadcasting studios of Laibach transmitter, **2897**
Dutton, J., S.C. Haydon and F. L. Jones, mechanism of spark breakdown in N, **3404**
van Dyck, W., with others, dielectric constant of diamond, **3143**

E

Eaglesfield, C. C., and P. E. Douglas, measurement of interface resistance and capacitance of oxide cathodes, **1661**
Earle, M. D., with V. E. Derr, properties of powdered BaTiO$_3$, **2243**
Earp, C. W., 'ambiguous-index system' of communication technique, **2889**
Eastwood, B., and C. C. Vodden, line-scanning valves and circuits, **2638**
Eberhardt, H., with O. Schäfer, circle-diagram recorder for a.f., **740**
Ebers, J. J., retarding-field oscillators, **2390**
Ebert, H., cable operating parameters at dm and m λ, **3349**
Ebert, J. E., and H. A. Finke, 20–1000-Mc/s sweep oscillator, **1056**
Eckart, G., reflection of plane e.m. waves in slightly inhomogeneous layers, **2006**; determination of variation of dielectric constant in heterogeneous layer, **2312**; theory of dielectric constant of mixtures, **3112**
—— and T. Kahan, 'internal' reflection in stratified medium, and application to troposphere, **236**
—— with T. Kahan, surface wave in dipole radiation over plane earth, **(D)469**; propagation of e.m. waves in atmospheric duct, **1402**
Eckert, J. P., Jr, with others, Binac digital computer, **1356**
Edelmann, H., calculation of h.f. filters with Tchebycheff type of amplification, **88, (C)2170**
Edgardh, B. H., sound-film spectrograph, **564**
Edwards, L. C., with W. G. Abel, source of long-distance back-scatter, **1082**
Efremov, A. N., with I. V. Zhilenkov, effect of reactance in λ/4 Lecher system on permittivity measurements, **3491**
Eggenberger, D. N., with P. L. Copeland, electric field and transit time as functions of diode current, **2382**
Egidi, C., reception of N.B.S. signals, **477**
Ehlermann, B., equipment for measuring number of turns of coils, **1968**
Ehrenberg, W., and J. Hirsch, conductivity/temperature characteristics of PbS in O$_2$, **702**
Einsele, T., time lag of forward conductance of Ge diodes, **3282**
—— and F. Baur, frequency dependence of magnetic after-effect in powder cores, **1328**
Einstein, P. A., with M. E. Haine, characteristics of hot-cathode electron-microscope guns, **2304**
Ekelöf, S., and others, integrating amplifier for c.r.o. recording of magnetic flux, **2276**
Eliefsen, B. S., with W. H. Hannahs, miniaturization, **1549**
Elliott, R. S., Booker's extension of Babinet's principle, **2496**; maximum frequency of coherent oscillations, **3618**
Ellis, C., automatic television-synchronizing generator, **835**
Ellis, C. L., test set for instrument-landing equipment, **1685**
Ellis, H. D. M., and J. C. Taylor, design of automatic sequential monitoring equipment, **2034**
Ellis, S. G., specimen charging in electron microscope, **3522**
—— with R. B. Atkinson, ferrography, **1705**
Ellison, M. A., ionospheric effects of solar flares, **134**
Ellison, T. H., propagation of sound waves through medium with very small random variations of refractive index, **885**
Ells, C. E., and G. D. Scott, structure of sputtered Ag films, **2239**
Elrod, H., Jr, velocity-potential expansion for piston source, **2677**
Elsmore, B., with M. Ryle, long-period variations in intensity of radio stars, **979**
—— with others, radio stars in northern hemisphere, **121**
Ely, B. M., first I.R.E. u.h.f. symposium, **1793**
Emden, K., solution for $\int e^{k(x + a\cos x)}dx$, **431**
Emms, E. T., theory and design of television frame output stages, **2960**; required figure of merit of frame deflector coils, **2917**
Emschermann, H. H., and O. Zinke, capacitance measurement at h.f., **1031**
von Engel, A., with P. F. Little, dispersion of electron beams in gases, **3406**
Engstrom, O. D., transmission measuring system, **206**
Engstrom, R. W., R. G. Stoudenheimer and A. M. Glover, production testing of multiplier phototubes, **3271**
Ensell, G., and S. D. Chatterjee, circular G-M counter, **1079**
Ensing, L., with J. M. L. Janssen, electro-analogue for studying regulating systems, **456**
Epelboin, I., study of macroscopic magnetic texture, **427**
—— and G. Girardin, study of FeNi alloy in steady and alternating magnetic fields, **3123**
—— with C. Abgrall, temperature variations of thin mumetal tapes in weak alternating fields, **2529**
Epstein, J., D. W. Peterson and O. M. Woodward, Jr, omnidirectional high-gain u.h.f. aerials, **3001**
Epsztein, B., with others, 5-kW wide-band klystron amplifier, **557**; new u.h.f. oscillator valves with wide electronic tuning band, **3616**
Erben, T., variation of dielectric constant of solvent with temperature, **687**
Eriksen, E. J., with others, v.h.f. multichannel carrier-telephony circuits in Colombia, **1430**
Erwall, L. G., with T. Westermark, study of surface-potential distribution by means of radioactive deposits, **2773**
Esculier, G. G., c.r. tubes for U.S. television receivers, **2355**
—— with J. Deschamps, practical design of parabolic microwave aerial, [illegible]
Eskenazi, M., simple system of electrical dimensions, **2775**
Espersen, G. A., L-cathode structure, **2080**
Espley, D. C., waveform systems and 'time equalizers', **72**
—— with others, London/Birmingham television radio-relay link, **820**
Ess, H., and J. Rossel, ionization pulses and charge-transport mechanism in diamond, **769**
Essen, L., velocity of light, **2180**
—— and K. D. Froome, dielectric constants of air and main constituents at 24 kMc/s, **1371**
Estrin, T. A., and T. J. Higgins, solution of boundary-value problems by multiple Laplace transformations, **712**
Ettlinger, A., with K. B. Benson, iconoscopes and image orthicons as film pickup devices, **838**
Etzold, H., quality assessment of rooms for electroacoustic transmissions, **2694**
Eubank, H., with others, hollow cathode for positive-ion studies in c.r. tubes, **1172**
Eubank, W. R., and others, factors influencing dielectric properties of BaTiO$_3$ ceramics, **2244**
Evans, H. T., with others, chemical reactions in BaO-on-W emitters, **3279**
Evans, W. R., control-system synthesis by root locus method, **2337**
Ewald, A. W., with L. Gildart, electron mobility and luminescence efficiency in CdS, **151**
Ewels, J., with H. K. Henisch, apparatus for measurements on semiconductors, **3175**
Ewen, H. I., and E. M. Purcell, radiation from galactic H at 1420 Mc/s, **981**
Eyfrig, R., height fluctuation of ionosphere F$_2$ layer, **673**

F

Fack, H., transients in diode valves, **2386**; theory of pull-in effect, **3379**
Faflick, C. E., with T. Morita, current distributions along coupled aerials and folded dipoles, **917**
Fagen, M. D., performance of ultrasonic vitreous-silica delay lines, **2462**
Fagot, J., with others, equipment for Paris-Lille television radio link, **2609**
Fahrnkopf, C. D., with others, investigation of interference from h.v. lines, **257**
Fairbairn, E. P., switching methods for v.h.f. communication networks, **2036**
Fairstein, E., sweep-type differential and integral pulse discriminator, **603**
Falkenhagen, H., with H. Jungnickel, coaxial line as measurement instrument in dm-wave band, **1369**
Familier, V., methods of calculation relating to inductive aerial coupling, **2141**
Fant, G., a.f. heterodyne filter, **1864**
Farrington, G. H., Fundamentals of Automatic Control, **(B)1707**
Faulkner, R. D., with B. E. Barnes, mechanical design of aperture-mask tricolour kinescopes, **851**
Fay, C. R., cleaning work by ultrasonic vibration, **3190**
Faynberg, Ya. B., with A. I. Akhiezer, slow e.m. waves, **1829**; h.f. oscillations in electron plasma, **3411**
Fechner, P., theory of magnetron in cut-off condition, **3619**
Federspiel, H., with E. Meyer-Hartwig, manufacture, regulating action and applications of thermistors, **688**
Fedida, S., pulse-amplitude-comparator flip-flop circuit, **2164**; p.c.m. system using circulated pulses, **3230**
Fehrer, E., with E. Ledinegg, theory of cavity-resonator measurement of permittivity in cm-wave range, **442**
Feik, K., 'universal' radiator groups, **573**
Feinberg, R., magnetic modulator, **338, 607**; Introduction to Electronic Circuits, **(B)1792**
Feinstein, J., tropospheric propagation beyond horizon, **1408**; condition for radiation from solar plasma, **2205**
—— and H. K. Sen, radio-wave generation by multistream interaction, **104**
Feit, L., with others, crosstalk in time-division-multiplex systems, **1104**
Felch, E. P., V. E. Legg and F. G. Merrill, magnetic modulators, **1528**
Feld, B. T., linear accelerator as pulsed neutron source, **1388**
Feldman, C., resistivity of Pt films on evaporated dielectric layers, **3126**
Feldtkeller, R., H. Wilde and G. Hoffmann, systematic relations between properties of Si/Fe-alloy stampings, **1631**
Félici, N. J., new rotary e.s. generators, **274**
Felker, J. H., information and energy, **2595**
Fellers, R. G., with K. L. Dunning, susceptance of thin iris in circular waveguide for TM$_{01}$ waves, **1513**
Felton, A., accuracy of measurement of electrical standards, **1952**
Fennessy, E., Decca harbour radar equipment, **1310**
Feofilov, P., Third All-Union Conference on luminescence, **3108**
Ferguson, A. E., feedback in timebase circuits, **2759**; amplifier frequency response, **(D)3386**
Ferguson, E. E., with P. G. Sulzer, sweep-frequency oblique-incidence measurements over 1150-km path, **3530**
Ferguson, T. J., G-10 Ge dot rectifier, **3241**
Féron, R., convexity and information, **3225**
Ferraro, V. C. A., theory of first phase of geomagnetic storm, **2504**
Ferré, J., inauguration of station F8REF for transmissions to French amateurs, **3237**
Ferrero, R., microwave frequency standards, **1951**
—— with others, experimental determination of gyro-interaction resonance curve, **2010**
Fert, C., and P. Gautier, inductance method for studying field of magnetic electron lens, **195**
Fetzer, V., calculation of generalized-parameter filter circuits, **1545**
Fewings, D. J., 'English Electric' television receiver, **839**
Fialkow, A., and I. Gerst, transfer function of RC networks, **350, 3369**
Fich, S., Transient Analysis in Electrical Engineering, **(B)716**
Fickeissen, O. O., with C. I. Aslakson, effect of meteorological conditions on shoran measurement of long distances, **1610**
Field, L. M., with Ping King Tien, space-charge waves in accelerated electron stream for microwave amplification, **2666**
Fifer, S., studies in nonlinear-vibration theory, **1881**
Fighiera, H., suppression of radio interference caused by television receivers, **2021**
Findlay, J. W., paths of waves returned from ionosphere E region, **397**; investigation of sudden fade-outs around 2 Mc/s, **404**
Fink, D. G., alternative approaches to colour television, **824**
Finkbein, U., directive aerial with increased line-wavelength, **3353**
Finke, H. A., with J. E. Ebert, 20–1000-Mc/s sweep oscillator, **1056**
Finkelnburg, W., and S. M. Segal, potential field of gas discharge, **103**
Finzi, L. A., D. P. Chandler and D. C. Beaumariage, transient response of magnetic amplifiers, **(A)926**
—— with others, analysis of transients in magnetic amplifiers, **2133**
Firestone, W. L., multiplex operation of klystrons, **497**
Fischer, F. A., radiation of pulses by plane piston diaphragms, **2**; reciprocity relations and electrical equivalents for electroacoustic transducers, **571, (C)2107**; random phenomena in oscillation technology (Wiener's theory), **2887**
Fischer, J., stationary temperature of current-carrying wire of moderate length, **375**
Fischer, K., impedance bridge for aerial measurements in medium-wave band, **205**
Fisher, J., television picture line selector, **1762**
Fisher, S., television-interference-free 40-W transmitter, **1458**
Fitzgerald, A. S., compensation of quiescent current in multistage magnetic amplifiers, [illegible]
Fitzgerald, J. A., new frequency divider, **3384**
Flambard, A., terrestrial radar, **994**
Fleck, J. T., and P. F. Ordung, realization of transfer ratio with RC ladder network, **348**
Fletcher, E. W., and S. F. Cooke, cathode-follower loudspeaker coupling, **947**
Fletcher, R. C., broad-band interdigital circuit for travelling-wave amplifiers, **3275**
Flicker, H., and J. Fracks, s.w. receivers, **251**
Flood, J. E., cathode-follower input impedance, **87**; crosstalk in time-division-multiplex communication systems, **(A)2606, 3556**; overloading of negative-feedback amplifiers under pulse conditions, [illegible]
Floréz, G., manufacture of quartz crystals, **175**
Florisson, C., measurement of power in ultrasonic beam, **3313**
Flory, L. E., and others, portable television pickup equipment, **2911**
Flury, C., with others, photoelectric effect in Cs-Ga, Cs-In and Cs-Tl photocathodes, **2069**
Fockler, W. G., c.r.o. for impulse testing, **1045**
Foley, T. U., network design charts, **322**
Fomenko, L. A., magnetic spectra of NiZn ferrite at r.f., **3465**
Fonda, G. R., and F. J. Studer, optical properties of CaSiO$_3$ phosphors, **3109**
Fontana, R. E., 'internal resonance' in circuits with nonlinear resistor, **75**
Fontanellaz, G., evaluation of transmission quality of telephone system, **1191**; objective measurements of intelligibility on telephones, **2708**
Foord, T. R., with B. Salvage, h.v. Schering bridge for dielectrics research, **3507**
Foot, J. B. L., 1400-Mc/s radiophone, **1732**
Ford, G. T., and E. J. Walsh, new valves for a coaxial-cable transmission system, **1165**
Forestier, H., and C. Guiot-Guillain, rare-earth ferrites with two Curie points, **3457**
Forestier, P., focusing baffle for loudspeakers, **2108**
Forgue, S. V., grid-controlled colour kinescope, **847**
—— R. R. Goodrich and A. D. Cope, properties of photoconductors, particularly Sb$_2$S$_3$, **1008**
—— with others, vidicon photoconductive camera tube, **1134**
Forsgren, S. K. H., calculation of ray paths in ionosphere, **782**
—— and O. F. Perers, recording of rain by radar, **681**
—— with O. E. H. Rydbeck, theory of electron-wave valves, **2077**
—— with others, microwave propagation in optical range, **789**
Försterling, K., wave propagation in ionosphere at oblique incidence, **472**
—— and H. O. Wüster, production of harmonics in ionosphere, **1061**
Forsyth-Grant, M. L., with G. R. Scott-Farnie, future developments in aeradio, **2037**
Fosgate, L., with W. Saraga, graphical methods for analysis and design of filters, **1546**
Foster, B. C., simple valve comparator, **2854**
Foster, L. W., tantalytic capacitors, **1223**
Fourrier-Savornin, F., with J. Savornin, sign of thermal e.m.f. of Si, **3132**
Fovet, H., with M. Denis, secondary-standard u.h.f. generator of the C.S.F., **1377**
Fowler, A. D., observer reaction to low-frequency interference in television pictures, **855, 1767**
Fowler, C. S., with R. E. Burgess, solar activity and ionospheric effects, May–Nov. 1948, **1715**
Fox, E. N., diffraction of plane sound pulse by grating, **2415**
Frachebourg, C., work of Electrical Engineering Commission for U.D.C., Rome, 1951, **2958**
Francini, G., generation of sawtooth from sinusoidal voltages, **1872**; analysers for aperiodic phenomena, **2271**
Francis, V. J., peak rate in random noise, **1766**
Francken, J. C., television camera tubes, **1452**
—— and R. Dorrestein, paraxial image formation in magnetic image iconoscope, **1753**
—— with others, image iconoscope, **1754**; e.s. electron-optical system with only one voltage, **3284**
François, P. A., 100-kW broadcasting transmitter at Villebon, Paris, **2361**
Frank, S. G. F., localizing Geiger counter, **230**
—— O. R. Frisch and G. G. Scarrott, mechanical kick-sorter (pulse-size analyser), **54**
Franken, B., with others, measurements of resistance variation with current for condensed Fe films at low temperatures, **2828**
Fränz, K., signals of given duration and minimum spectral width, **1722**
—— and S. F. Pinasco, *Q* meter based on free damped oscillations, **1676**
Franz, W., electronic conduction in crystalline insulating materials, **3475**
Fraser, D. O., American plan for air traffic control, **682**
Fraticelli, R., with others, equipment for Paris-Lille television radio link, [illegible]
Frazier, R. H., Dromgoole effect, **(D)3417**
Freedman, N. S., and K. M. McLaughlin, phosphor-screen production for colour kinescopes, **849**
Freedman, S., welding and soldering Al with Chemalloy, **2248**
Freeman, G. P., and H. A. van der Velden, counting properties of diamond, **1398**, differences in, **2004, 2308**
Freeman, J. J., admittance of diode with retarding field, **3605**
Fricke, H., transistor amplifiers, operation and characteristics of, **639**, circuits and construction types of, **640**; reactance-valve circuits for large frequency deviations, **1462**; arrangements with frequency-dependent resistance and frequency-independent reactance, **3023**; f.m. of magnetron in dm-λ range, **3294**
Friedlander, F. G., half-plane diffraction problem, **969**
Friedman, B., propagation in nonhomogeneous atmosphere, **661**
Friedman, H., S. W. Lichtman and E. T. Byram, rocket measurements of solar X rays and extreme-ultraviolet light, **976**
Friedrichs, K. O., mathematical aspects of quantum theory of fields, **644**
Friend, A. W., deflection and convergence in colour kinescopes, **853**
Frigerio, G., heat treatment and internal friction of quartz resonators, **3144**
Friis, R. W., and K. D. Smith, repeater equipment for TD-2 microwave relay system, **1110**
—— with others, TD-2 microwave radio relay system, **1109**
Frisch, O. R., with others, mechanical kick-sorter (pulse-size analyser), **54**
Fritz, K., development of magnetron in Germany up to 1945, **2951**; potentials and electron paths in multisegment magnetrons, **2952**
Fritz, S., ozone measurements during sudden ionospheric disturbances, **1604**
Fritzsche, H., interpretation of double reversal of Hall effect in Te, **3130**
Fromageot, A., and B. Louis, propagation of e.m. waves along a conducting dielectric-covered wire, **317, (D)3339**
Fromy, É., systematic analysis of radio receivers, **252**
Froome, K. D., determination of velocity of e.m. waves by microwave interferometry, **2313, 3532**
—— with L. Essen, dielectric constants of air and main constituents at 24 kMc/s, **1371**
Frühauf, H., u.h.f. propagation, in conducting rectangular waveguides, **35**, in circular waveguides, **581**
Fründt, H. J., 50-Mc/s beam link with ± 500-kc/s frequency swing, **2614**
Fuchs, G., reflections in coaxial cables due to impedance irregularities, **(A)2554, 3495**
—— with P. Bréant, television transmission tests on coaxial cables, **1439**
Fuchs, J., effective propagation velocity of short waves, **471**
Fujimura, T., with others, permittivity and permeability of ferrites at [illegible] λ, **2535**
Fukushima, K., with Y. Kikuchi, theory and design of laminated magnetostriction vibrators, **302**
Fuller, C. S., diffusion of donor and acceptor elements in Ge, **2822**
—— H. C. Theuerer and W. van Roosbroeck, thermally produced acceptors in Ge, **2235**
Fulton, A. S., with R. R. Bennett, generation and measurement of low-frequency random noise, **1030**
Funk, P., application of Newton's law of formation of images in electron optics, **1699**
Furrer, W., Die elektroakustischen Wandler, **(B)906**

G

Gabler, H., Funkpeiler, Grundlagen and Anwendungen, **(B)2226**
—— G. Gresky and W. Runge, comparison of frame coils and stretched-wire loops for ship d.f., **2517**
Gabor, D., plasma oscillations, **652**; wave theory of plasma, **3410**
Gabovich, M. D., optimum focusing by electron lens, **463**
[illegible] W. P., frequency stabilization system for microwave dielectric measurements, **3167**
Gagel, H., and H. Dittler, materials for electrical contacts, **3146**
Gaillard, A., Allouis-Issoudun h.f. group of Radiodiffusion Française, **1735**
[illegible] P., with R. Aschen, simple ionosphere sounder, **1917**
Gall, D. C., new principles in electrical instruments, [illegible]
[illegible] F., trends in high-fidelity magnetic recording, **3332**
Gallet, R., sporadic-E layer and turbulence in upper atmosphere, **1912**
[illegible] G., ground conductivity measurements in Italy, **438**

Galway, H., Echo Sounding at Sea (British Practice), (B)2226
Gamble, E. H., with R. L. Cosgriff, automatic control of inaccessible terminal voltages, 1062
Garbuny, M., with others, reflex resnatron for u.h.f. television, 3617
Garcia, L. C., Barcelona long-wave aerial, 42
Gardère, H., voice-frequency telegraphy systems, ph.m., 1100, f.m., 3548
Gardiner, P. C., calibration of loop aerials for field-strength meters, 452
Gardner, F. F., with others, ionospheric thermal radiation at r.f., 406
Garlick, G. F. J., recent research on radio-luminescence, 3441
—— and G. T. Wright, characteristics of scintillation counters, 3528
Garoff, K., with others, single- and multi-iris resonant structures, 2708
Garrett, D. E., and F. G. Cole, general-purpose electronic wattmeter, 0–71 kc/s, 0–50 W, 1982
Garrett, M. W., axially symmetric systems for generating and measuring magnetic fields, 964
Garrido, E. Y., with R. L. Ortueta, semiconductors, 159
Garrido, F. L., lenses for microwaves, 49
Garton, C. G., properties of insulating materials used in instruments, 1940
Gatfield, E. N., velocity of ultrasonic pulse in engineering materials, 3514
Gathmann, H., with H. Schiesser, construction of a.f. amplifiers for studios, 950
Gautier, P., with C. Fert, inductance method for studying field of magnetic electron lens, 195
Gautier, T. N., with V. C. Pineo, frequency dependence of duration of meteor-trail echoes, 1592
Gauzit, J., temperature of atmosphere at 100 km height, 1290
Gauzit, M., with others, ion image of emissive anode, 1695
Gavin, M. R., with O. H. Critchley, transit-time oscillations in triodes, 2864
Gavreau, V., M. Dratz and A. Calaora, absolute method of calibrating microphones, 2690
—— with F. Canac, ultrasonics in air, 6
Gea Sacasa, R., prediction of optimum working frequencies for any distance, [illegible]
Gebauer, R., and H. Kosmahl, variation of h.f. power of drift-space valve, 2391
Gebbie, H. A., and C. G. Cannon, optical properties of amorphous Se, 3128
—— and D. G. Kiely, dielectric constant and loss of amorphous Se at 3-cm λ, 3466
van Geel, W. C., rectifiers, 1939
—— and B. C. Bouma, unforming of electrolytic and barrier-layer rectifiers, 2042
Gefahrt, J., with H. Bomke, Einführung in die Theorie der Ausbreitung elektromagnetischer Wellen in Leitungen und Hohlkabeln, (B)[illegible]
Geffroy, M., design of ionospheric radar sounder, 3084
Geisler, H. J., r.f. bursts actuate gas-tube switch, 1786
van Gelder, Z., with J. L. H. Jonker, switch tubes for communication equipment, 1178, 1789
—— with others, interference effects on television pictures, 2641
Gemperle, H., loudspeaker with phase reversal, 20, 2979; acoustic problems of intercommunication systems using loudspeakers as microphones, 1820
Génin, R., rise time of artificial delay lines, 2143
Gennaoui, A., u.h.f. measurements of permittivities and absorption coefficients of gases and vapours, 1368
George, E. F., theory of E-layer ionization, 1915
George, T. S., fluctuations of ground clutter in radar, (A)2514, 3435
Gérardin, L., design of radar wide-band i.f. amplifiers, 89
Gerber, E. A., quartz-crystal measurements at 10–180 Mc/s, 1379
Gerhardt, J. R., with C. M. Crain, measurement of parameters involved in theory of tropospheric radio scattering, 1411
Gerks, I. H., propagation of signals from 412-Mc/s high-power transmitter, 788
—— with others, u.h.f. moon relay, 2008
Germany, L. W., with others, improvements in image-iconoscope-type tubes, 2832
Germer, L. H., arcing at electrical contacts on closure, 665
Gerrand, J. H., D.M.E. project of Department of Civil Aviation, Australia, 1315
Gerritsen, A. N., and F. van den Burg, amplifiers for low-temperature operation, 1875
Gershman, S. G., correlation coefficient as criterion of acoustic quality of room, 2973
Gerson, N. C., critical survey of ionosphere temperatures, 396; movements of ionosphere sporadic E layer, 1914, 2509
Gerst, I., with A. Fialkow, transfer function of RC networks, 350, 3369
Geschwinde, H., nomographic determination of h.f. feeder efficiency, 330
Getmantsev, G. G., radiation of e.m. waves from sun and galaxy, 1279
Gevers, M., measurement of permittivity and loss angle of solids at 3 kMc/s, 1033
Geyger, W. A., magnetic amplifiers with Orthonol-tape cores, 925
Gialanella, L., pulsations of sun's diameter, 667
Gibault, G., very rapid pulsations observed during magnetic storm, 1910
Gibbons, J. J., and R. J. Nertney, wave solutions for ionospherically reflected long waves, 137
Gibellato, S., total reflection of e.m. wave with reflection of evanescent wave, 967
Gibson, A. F., single-contact photocells, PbS, 2654, PbTe, 2655; absorption spectra of single crystals of PbS, PbSe and PbTe, 3107
—— W. D. Lawson and T. S. Moss, long-wave limit of PbSe photocells, 1771
von Gierke, H. E., and W. W. von Wittern, capacitor-microphone sensitivity measurement, (C)894
Gilardin, G., with I. Épelboin, study of FeNi alloy in steady and alternating magnetic fields, 3123
Gilardini, A., generator of variable-length pulses, 635
Gilbert, E. N., n-terminal switching circuits, 73; comparison of signalling alphabets, 2594
Gildart, L., and A. W. Ewald, electron mobility and luminescence efficiency in CdS, 151
Gifford, C. L. S., Helmholtz resonators in broadcasting studios, 2424
Gill, S., with others, The Preparation of Programs for an Electronic Digital Computer, (B)1655
Gillette, F. N., direct-projection system for theatre television, 3248
Gilloux, H., line-scan transformer considered as pulse transformer, 1141; components exhibition, Paris, 1952, 2154
Gilotaux, P., disk recording and reproduction, 3331
Giltay, J., ferromagnetic states, 167
Gilvarry, J. J., and D. F. Rutland, general theory of voltage stabilizers, 814; general theory of current stabilizers, 2623
Ginsburg, V. L., null effect of electron collisions on absorption of radio waves, 2798; magneto-hydrodynamic waves in gases, 3412
Giordano, A. F., blocked-oscillator design for television receivers, 2061
Giustini, S., and R. Tozzi, measurement of high powers at microwave frequencies, 3185
Givens, M. P., thyratron grid-voltage peak, 875
Glaser, G., conductivity and breakdown strength of glass films, 2833
Glaser, W., resolution and magnification limit of magnetic electron microscope, 459; refractive index in electron optics, (D)1998
—— and H. Robl, rigorous calculation of typical e.s. electron lenses, 1698
Glass, W. G., with L. D. Smullin, offset waveguide junction as reactive element, 910
Glauberman, A. E., and I. I. Tal'yanski, electron emission from metal in electric field, 1467
Glenn, W. E., pulse-height distribution analyser, 1846
Glover, A. M., with others, production testing of multiplier phototubes, 3271
Gnanalingam, S., and K. Weekes, weak echoes from ionosphere at 1·42 Mc/s, 3427
Göbel, R., new sonic and ultrasonic generators, 2679
Gobrecht, H., and D. Hahn, luminescence of alkali sulphides and sulphates, 3110
—— D. Hahn and H. Dammann, decay of CaWO$_4$ and ZnO phosphors after electron-beam excitation, 3442
Goebel, G. television pickup technique, 1132
Goercke, P., CdS photocells, 1770
—— E. Saenger and I. Bredt, ionization and luminescence of flames, 657
Goertz, M., Fe-Si alloys heat treated in magnetic field, 692
—— with H. J. Williams, domain structure of perminvar, 2532
Gold, E., thunderbolts, (AD)2808
Gold, T., design of folded ultrasonic delay line, 620
—— with H. Bondi, is there an aether?, (D)2203
Goldberg, E. A., step multiplier for guided-missile computer, 234
Goldberg, L., universal direct-coupled differential amplifier, 366
Goldbohm, E., harbour radar at Ijmuiden, 3432
Goldmark, P. C., and J. M. Hollywood, improving sharpness of television pictures, 828, 1444
—— J. W. Christensen and J. J. Reeves, U.S.A. standard on colour television, 831, 1447
Golds, L. B. S., methods of presentation of instrument readings, 1970
Goldsmith, P., with E. A. Roberts, piezoelectric crystals for pressure, temperature and humidity measurements, (A)1058
Goldstein, H., time constant of magnetic amplifier, 927
Goldstein, L., and N. L. Cohen, gas-discharge plasma in h.f. e.m. field, 1890
—— M. A. Lampert and J. F. Heney, magneto-optics of electron gas for microwaves, 912, (C)913, 914
—— with P. Parzen, effect of hydrostatic pressure in electron beam on operation of travelling-wave valves, 1151; current fluctuations in d.c. gas-discharge plasma, 1891
Golomb, M., and E. Usdin, theory of multidimensional servo systems, 2338
Gomard, P., with others, saturable reactors as r.f. tuning elements, 3394
Good, W. E., techniques in microwave spectroscopy, 1051
Goode, H. H., simulation, its use in system design, 1059
Goodell, J. D., and T. Lode, multistable magnetic memory devices, 1949
Goodman, R. M., digital-computer timing unit, 434
Goodman, W. D., British applications of carrier-current principles, 1426
Goodrich, R. R., with others, properties of photoconductors, particularly Sb$_2$S$_3$, 1008; vidicon photoconductive camera tube, 1134
Goodwin, J. L., sound reinforcement and reproduction for Royal Festival Hall, 1821
Gordeev, G. V., plasma oscillations and striations, 2777
Gordon, D. S., phase-angle meter, (D)2858
Gordon, J. F., variable pulse delay for radar ranging, 331
Gordy, W., with others, microwave spectroscopy at 2–3-mm λ, 1896
Görlich, P., noise in light-sensitive semiconductors, 1934; Die Photozellen, (B)[illegible]
Gorter, E. W., with J. J. Went, magnetic and electrical properties of ferroxcube, 2823
—— with others, ferroxdure, 2824
Goryunova, N. A., I. D. Konozenko and A. P. Obukhov, electrical properties of thin layers containing grey tin, 2829
Gosselin, J. H., errors in potentiometer comparison measurements, 203
Gottfried, N. H., with others, microwave radio links of Bonneville Power Administration, 3236
Goubau, G., Zenneck ground wave, 773; excitation of surface waves, 2704
Goubau, G., increase of aerial bandwidth by compensation circuits, 39, 3350
Goudet, G., travelling-wave valves in radio beam links, 2894
Goudot, A., signal transmission in nervous system, 453
Gough, V. E., 3-dimensional electrical potential analyser, (D)2257
Goundry, R. A., with W. K. Squires, constant-input-impedance television second detector, 2059
Gouriet, G. G., measuring television picture detail, 2921
Grace, A. C., and J. A. Lane, surface-wave transmission line, 3338
Grace, C. H., characteristics of normal E layer, 133
Grace, F., with E. S. Rittner, impedance measurements on PbS photoconductive cells, 3595
Grad, E. M., with G. Liebmann, image-forming properties of magnetic electron lenses, 1701
Graf, W. L., C. L. Comar and I. B. Whitney, sensitivities of windowless and end-window counters, 1397
Grammelsdorff, F., and W. Guckenburg, classification of magnetic-recording tapes, 2982
Grammer, G., Π-network tank circuits for reduction of television interference, 2359
Granger, J. V. N., and T. Morita, r.f. current distributions on aircraft structures, 47
—— with J. T. Bolljahn, use of complementary slots in aircraft-aerial impedance measurements on models, 594
Grantham, J. P., rotating joints for microwave equipment, 907
Grantham, R. E., reflectionless waveguide termination, 1674
Granville, J. W., and C. A. Hogarth, thermoelectric effects at surfaces of transistor materials, 161
—— with C. A. Hogarth, rectification effects at surfaces of Ge and PbS crystals, 1635
Gratama, S., directional couplers in aerial-matching problems, 2435
Grave, H. F., Gleichrichtermesstechnik, (B)213
Gray, F., electron streams in planar diode, 1164
Gray, H. J., Jr, digital-computer circuits, 1357
Graybeal, T. D., block-diagram network transformation, 1534; 2-channel rectangular-pulse generator, 1873
Graziadei, H., top feeding of antifade broadcasting aerial, 51
Grebe, O., magnetic-powder clutch, 3191
Grebenkemper, C. J., and J. P. Hagen, h.f. resistance of metals in normal and superconducting state, 3060
Greefkes, J. A., with others, delta modulation, 2603
Green, E., input impedance and properties of networks, 938
Green, J., performance of television picture tubes, 1763
Greenaway, K. R., radar as aid to air navigation in Arctic, 1316
Greenberg, J. M., with E. W. Montroll, scattering of plane waves by soft spheres and cylinders, 3397
Greene, F. M., and M. Solow, development of v.h.f. field-strength standards, (A)2553
Greenhow, J. S., radio echoes from meteor trails, 2493, for investigating winds at altitudes of 80–100 km, 3083
—— with J. G. Davies, summer daytime meteor streams of 1949 and 1950, 386
Greenstein, P., with B. J. Ley, electro-optical shutters for ballistics photography, 3529
Greenstone, R., with C. D. Salzberg, systematic ionospheric winds, 1298
Greiner, J., anisotropy of magnetization of magnetic-recorder tapes, 3333
Grenville-Wells, H. J., texture of diamonds for particle counting, 3211
Greaky, G., with others, comparison of frame coils and stretched-wire loops for ship d.f., 2517
de Greve, L., with others, resistivity measurements on thin Fe films, 2238
Grevel, R., F. W. Gundlach and H. Herklotz, display of 3-dimensional characteristics with c.r.o., 1977
Gridley, A., with others, design for standard resistance coils, 2452
Griffeth, R. L., and E. R. Younglove, mica paper for insulation, 3148
Griffith, G. W. S., with others, London/Birmingham television radio-relay link, 820
Griffiths, D. H., with others, variation with depth of geomagnetic field, 1596
Grimes, D. M., and S. Legvold, d.c. resistance of Se and Cu$_2$O rectifiers at 79°–300°K, 2621
Grivet, P., electron lens, mathematical model of, 1394, 2300, cardinal parameters of new model of, 2301
—— and M. Bernard, two-cylinder e.s. lens, gaussian components in, 1393, theory of, 2302; axial potential of 3-element e.s. lens, 2865
van't Groenewout, H. W. F., with J. P. Schouten, analysis of distortion in p.c.m. systems, 2332
Grognot, P., ultrasonic spectra from aircraft engines, and their physiological effects, 1496
de Groot, W., scientific research by Philips' Industries, 1891–1951, 560
Groschwitz, E., and H. Hönl, diffraction of e.m. waves at a straight slit, 2183
Grosjean, J. A., indicator of harbour radar at Ijmuiden, 3433
Gross, E. P., interaction of electron and lattice oscillator, 1575
Gross, W., calculation of e.s. capacitance of conductor, 3073
Grossbohlin, H. W., with others, self-focusing picture tube, 2919
Grosskopf, H., capacitor microphones for N.W.D.R. studios, 893
Grosskopf, J., u.s.w. propagation at 30–100-Mc/s, 1085
Grube, W. L., with J. H. L. Watson, reliability of internal standards for calibrating electron microscopes, 3521
Gruenberg, H., susceptance of symmetrically placed inductive posts in rectangular waveguide, 2991; waveguide-fed slots radiating into parallel-plate regions, 3343
Gruens, O., 8-kc/s sound spectrograph, 9
Grunert, J., effect of direct and reflected sound on sound pattern, 3323
Gubanov, A. I., theory of contact between semiconductors of same type, 424
Guckenburg, W., with F. Grammelsdorff, classification of magnetic-recording tapes, 2982
Guelke, R., and H. Helm, threshold of hearing in relation to equal-loudness contours, 2692
Guenard, P., O. Doehler and R. Warnecke, transmission lines with periodic structure, 3615
—— B. Epsztein and P. Cahour, 5-kW wide-band klystron amplifier, 557
—— and others, new u.h.f. oscillator valves with wide electronic tuning band, 3616
—— with R. Warnecke, Les Tubes Électroniques à Commande par Modulation de Vitesse, (B)2095
Guennec, M., with others, sonic and ultrasonic noise in engineering and aviation, 2102
Guenot, L., measurement of image impedance and image attenuation, 1961
Guenther, R., radio relay design data for 60–600 Mc/s, 495, (C)2030
Guérineau, M., latest types of C.F.T.H. broadcasting transmitters, 3587
Guha, U. C., reversal of polarization of microwaves from sunspots, 2782
—— with others, vertical propagation of e.m. waves in ionosphere, 243
Guignard, J. P., with Y. Doucet, resistance of thermistors as function of temperature, 3062
Guillaud, C., new high-coercivity high-μ low-loss ferromagnetic materials, 3119
—— and R. Bertrand, conductivity of semiconducting oxide mixtures, 2525
Guillaume, M., with M. Duchaussoy, construction of scanning assembly for wide-angle flat-faced c.r. tube, 2637
Guillemin, E. A., ladder development of RC networks, 2144
Guiot-Guillain, G., with H. Forestier, rare-earth ferrites with two Curie points, 3457
Gundert, E., control of current distribution in electron beams, 2072
—— with H. Rothe, effect of electron transit-time on efficiency of transmitting tetrodes, 3612
Gundlach, F. W., h.f. generator with uniform RC line as frequency-control feedback unit, 3045; operation of serrasoid modulator, 3267; generation and amplification of u.h.f. oscillations, 3291
—— and K. Schörken, secondary emission in whole-anode magnetrons, 1791
—— with others, single-beam c.r.o. for simultaneous display of several phenomena, 1044; display of 3-dimensional characteristics with c.r.o., 1977
Gunn-Russell, C., with others, automatic monitoring of broadcast programmes, 269
Gunter, F. B., 940–960-Mc/s communication equipment, 494
Günther, H., stabilization of direct voltages, 273
Guptill, E. W., and A. D. MacDonald, acoustic field near circular transducer, 2678
Gutmann, F., electronic instrumentation for chemical laboratories, 2565, [illegible]
Güttner, W., piezoelectric transducers for hearing aids, 16
Gutton, H., J. Baret and J. Hugon, equipment for Paris-Lille television radio link, 2609
Guttwein, G. K., and A. I. Dranetz, self-generating accelerometers, 748

H

Haacke, W., free oscillations in n-mesh networks with varying parameters, 2470
Haaijman, P. W., with J. L. H. Jonker, wire capacitor and other composite drawn products, 1853
Haantjes, J., and F. W. de Vrijer, flicker in television pictures, 1128
—— with others, Electronic Valves, Book V—Application of the Electronic Valve in Radio Receivers and Amplifiers, Vol. 2—A.F. Amplification, the Output Stage, Power Supply, (B)2765
Haar, G., nonlinear characteristics of ear, 10; quadratic and cubic distortion in transmission of music, 3322
Haase, G., with M. Seddig, measurement of pressures $< 10^{-7}$ mm Hg by adsorption manometer, 2520
Haase, K. H., characteristic functions and attenuation calculation for symmetrical and antimetrical filters, 3377
Hackerman, N., with E. L. Antes, contact-potential variations of freshly condensed metal films at low pressures, 1886
Hacks, J., control curves for amplitude-controlled amplifier, 86; f.m. systems with negative feedback, 1427
—— with H. Flicker, s.w. receivers, 251
Hadfield, D., and D. L. Mawson, permanent magnets for spectrographs and nuclear physical research, 3480
Hafler, D., and H. I. Keroes, ultralinear a.f. amplifier, 1512
Hagen, J. P., with C. J. Grebenkemper, h.f. resistance of metals in normal and superconducting state, 3060
Hahn, D., with H. Gobrecht, luminescence of alkali sulphides and sulphates, 3110
—— with others, decay of CaWO$_4$ and ZnO phosphors after electron-beam excitation, 3442
Hahn, E. E., electrical properties of ZnO semiconductor, 699
Haigh, C. P., toroidal G-M counter, 768
Haine, M. E., and P. A. Einstein, characteristics of hot-cathode electron-microscope guns, 2304
Hajek, J., scale-overlap and frequency errors in rectifier-type meters, 2279
Hall, G., with others, hollow cathode for positive-ion studies in c.r. tubes, 1172
Hall, H. C., elimination of stray-capacitance errors in Schering-bridge measurements, 3504
Hall, H. H., J. Bardeen and G. L. Pearson, effects of pressure and temperature on resistance of Ge p-n junctions, 1324
Hall, J. A., with others, design for standard resistance coils, 2452
Hall, R. E., and E. Coop, components for instruments, 1865
Hall, R. N., electron-hole recombination in Ge, 3453
Hallén, E., characteristic impedance of vacuum, 3419
Halpern, W., with others, magnet current stabilizer, 760
Hamada, S., E. Takagi and A. Sato, vibrating-capacitor electrometer, 3500
Hamburger, G. L., automatic a.f. response-curve tracer, 1047
Hamer, E. G., v.h.f. common-aerial working, 538; harmonic distortion of modulation due to feeder echoes, 2890; theoretical performance of multichannel system using f.m., 3551
—— and L. J. Herbst, receivers for use at 460 Mc/s, 793
Hamer, R., with others, subscriber's single-channel v.h.f. R/T equipment, 492
Hamon, B. V., dielectric loss factor determination from d.c. measurements, 2848
Han Chang. See Chang, Han.
Hanel, R., making ultrasonic waves visible, 562
Hannahs, W. H., and B. S. Ellefsen, miniaturization, 1549
Hannemann, I. G., and B. J. Ramboll, construction and erection of aerial masts, 1736
Hansel, P. G., polarization errors of radio direction finders, 142
Hansell, G. E., application of transmitter diversity in printer radiotelegraphy, 799
Hansen, G., Belgian television standards, 2344
Hansen, J., directive aerials at Herstedvester, Denmark, 1736
Hansen, J. R., with others, reflex resnatron for u.h.f. television, 3617
Harang, L., The Aurorae, (B)1919
Harbottle, H. R., simple derivation of standard equations for uniform transmission line, 3341
Harder, E. L., and J. T. Carleton, new techniques on Anacom computer, 2255
—— and W. F. Horton, response time of magnetic amplifiers, 3013
Hardie, A. M., magnetron effect in high-power valves, 3606
—— and P. A. V. Thomas, slow-speed circular timebase, 2755
Harmans, J., choice of i.f. in television receivers, 2058
Harper, A. F. A., with R. G. Wylie, analysis of galvanometer amplifier and its response to alternating voltages and mechanical vibration, 1972
Harries, E. E., and M. Cawein, concentric-line u.h.f. tuning unit, 1759
Harries, W., molecular flow in connected tubes, 684
Harrington, B. G. V., with J. A. Tanner, frequency-compensated direct-coupled amplifier for 4-channel pen recorder, (D)1878
Harrington, J., with R. Cooper, positive current creep in Se rectifiers, 2332
Harrington, R. F., and W. R. LePage, field pattern of circular array with concentric cylindrical reflector, 1212
Harris, C. M., and C. T. Molloy, theory of sound-absorptive materials, 1818
Harris, D. B., product phase modulation and demodulation, (C)256; new u.h.f. resnatron designs and applications, 555
Harris, F. K., Electrical Measurements, (B)3187
Harris, G. G., radar for traffic control at R.A.E., Farnborough, 1313
Harris, I. A., small-signal analysis for v.h.f. valve circuits, 2137
Harris, L. A., axially symmetrical electron-beam and magnetic-field systems, 2865; instabilities in smooth anode cylindrical magnetron, 3293
Harris, N. L., cold-cathode gas discharge as switching device, 3274
Harrison, C. W., linear signal prediction in television, 2805
Harrison, M., A. O. Sykes and P. G. Marcotte, reciprocity calibration of piezoelectric accelerometers, 3518
Harrison, W. J. D., with others, principles and practices in tropicalization, 176
Hart, R. W., with E. W. Montroll, scattering of plane waves by soft obstacles, cylinders, spheroids and disks, 2861

Hartig, E. O., and others, measurement of aerial impedance using receiving aerial, **585**

Hartmann, J., and B. Larris, air-jet generator for waves in liquids, **300**

—— and E. Trudso, synchronization of air-jet generators, **299**

Hartshorn, L., aspects of electrical-instrument design, **1968**

Harvard University, Staff of Computation Laboratory, Tables of Bessel Functions of the First Kind of Orders 79–135, **(B)1026**; Synthesis of Electronic Computing and Control Circuits, **(B)1656**

Harvey, A. F., instruments for use in the microwave band, **1969**

Harvey, F. K., with W. E. Kock, photographic display of sound-wave and microwave fields, **3**

Hasselbeck, W., periodic h.f. pulses, peak power measurement for, **783**, measurement of peak voltage of, **1955**; rules for construction of i.f. amplifiers, **2169**

Hathaway, J. L., and R. E. Lafferty, aural monitor for f.m. transmissions, **2601**

Hatoyama, M., with others, a.c characteristics of Si p-n junctions, **1323**

Hauser, A. A., Jr, generalized method for analysing servomechanisms, **2040**

Havens, R. J., R. T. Koll and H. E. LaGow, pressure, density and temperature of atmosphere, **2506**

Hawkins, G. S., with A. Aspinall, summer daytime meteor streams of 1949 and 1950, **385**

Hawkins, J. E., lorac radiolocation system, **996**

Haworth, J. R., millisecond timing unit, **2842**

Hay, G. A., receiving valves for electrometer use, **541**

Haycock, O. C., and J. S. Ajioka, radiation characteristics of helical aerials, **2995**

—— and F. L. Wiley, radiation patterns and conductance of slotted-cylinder aerials, **1842**

Haydon, S. C., with others, mechanism of spark breakdown in N, **3404**

Haynes, H. E., electronic volume compression, **2152**

Haynes, J. R., and W. C. Westphal, drift mobility of electrons in Si, **2233**

Hazard, C., with R. H. Brown, r.f. radiation, from Andromeda nebula, **1285**, from Cygnus region, **1904**, extra-galactic, **2215**

Heading, J., and R. T. P. Whipple, oblique reflection of long waves from ionosphere, **2873**

Hearmon, R. F. S., elastic constants of piezoelectric crystals, **3141**

Hebb, M. H., with E. A. Taft, quenching of photoconductivity in CdS, **3105**

Hedrick, L. C., synchronizer for 100-kc/s square-wave generator, **634**

Heidenreich, R. D., and E. A. Nesbitt, physical structure and magnetic anisotropy of alnico-5, **2530**

—— with E. A. Nesbitt, magnetic structure of alnico-5, **2531**, **3456**

Heijn, H. J., with J. P. Schouten, subharmonic oscillations in circuits including iron-core reactors, **2155**

Heiland, G., ZnO, energy conversion in irradiation of, **3469**, conductivity variations of, **3470**

Hein, C. C., and W. M. Hickam, impurities in Chilean Cu in relation to Cu_2O rectifiers, **1021**

Heins, A. E., coupling of two ducts, **1258**

Heins, A. J., dynamic measurements on receiving valves, **2288**

Heiser, W., with B. Amos, internal television-receiver interference, **1143**

Hekimian, N. C., frequency-deviation meter, **2856**

Helliwell, R. A., with W. Snyder, wave polarization chart for magneto-ionic theory, **2572**

Helm, H., with R. Guelke, threshold of hearing in relation to equal-loudness contours, **2692**

Helmes, E., voltage source (2·5–6 V) constant to within ±0·1%, **3563**

Hémardinquer, P., sound reproducer for engraved-tape records, **2426**

Henderson, S. T., recent developments in luminescent materials, **1623**

Heney, J. F., with others, magneto-optics of electron gas for microwaves, **912**, **(C)913**, **914**

Henisch, H. K., semiconductors, barriers in, **377**, industrial applications of, **2820**; Semiconducting Materials, **(B)1648**

—— and J. Ewels, apparatus for measurements on semiconductors, **3175**

—— and E. W. Saker, effect of Hg on Se, **2539**

Henkels, H. W., electrical properties of Se, single crystals, **698**, microcrystalline Se, **1335**

Henning, A. R., fibreglass in electrical insulation, **3477**

Henry, J., phase measurement, **2273**

Henry, R. L., R. K. F. Scal and G. Shapiro, new techniques for electronic miniaturization, **2754**

Hentschel, G., 4-circuit band-pass filter and bandwidth switching by back coupling, **69**

Heppner, J. P., E. C. Byrne and A. E. Belon, association of absorption and E_s ionization with aurora at high latitudes, **2511**

Herbst, L. J., with E. G. Hamer, receivers for use at 460 Mc/s, **793**

Herbst, P. J., and E. M. Washburn, frequency stability for television offset-carrier operation, **2913**

—— R. O. Drew and S. W. Johnson, compensation in television film reproduction, **1443**

Herbstreit, J. W., with others, service range for aircraft communication at frequencies > 50 Mc/s, **2616**

Heremans, F., with others, resistivity measurements on thin Fe films, **2238**

Heritage, R. J., metal-film resistors, **2736**

Herklotz, H., with others, display of 3-dimensional characteristics with c.r.o., **1977**

Herlofson, N., plasma resonance in ionosphere irregularities, **403**

Hermach, F. L., thermal converters as a.c.-d.c. transfer standards for current and voltage measurements at a.f., **2552**

Hermanson, C. A., with others, stereo-television in remote control, **1130**

Hernqvist, K. G., space-charge and ion-trapping effects in tetrodes, **1170**

Herold, E. W., television colour kinescope operation, **843**

Herpin, A., with T. Delourmel, magnetostriction in rotating field, **384**

Herrent, A., and G. Novgorodsky, application of Bode's relation to calculation of Nyquist diagram, **56**

Herrmann, G., and S. Wagener, The Oxide-Coated Cathode, Vol. 1, Manufacture, **(B)2094**, **(B)2955**, Vol. 2, Physics, **(B**

Herwig, L. O., photoelectric control of ion source of e.s. particle accelerator, **1066**

Herman, H., bases of calculation for design of radio communication systems, **1428**

Herzog, G. B., and A. van der Ziel, shot noise in Ge single crystals, **1936**

Herzog, R. F. K., electron-optical properties of magnetic deflection fields, **1999**

Herzog, W., difference oscillators and their constancy, **80**; build-up process in oscillators, **2161**; attainment of very high frequency stability, **2734**

Hess, H. A., round-the-world signals, **2535**

Hess, P. H., with H. L. Jones, identification of tornadoes by observation of atmospherics waveform, **3429**

Hess, V. F., studies on radioactivity of atmosphere, **412**

Hesse, H., u.h.f. television converter, **2635**

Hewel, H., portable pickup equipment for 625-line television, **2956**

Hewish, A., diffraction of radio waves in phase-changing ionosphere, **1294**

Hey, J. S., radio astronomy, **668**

Heymann, O., calculation of transconductance of planar systems from theory of potential, **864**

Heyn, F. A., electromagnet for synchrocyclotron at Amsterdam, **223**

Hibberd, F. H., with others, resonance in gyro-interaction of radio waves, **3214**

Hibbs, H. H., with K. S. Kelleher, organ-pipe radar scanner, **1920**

Hibi, T., and K. Ishikawa, thermionic emission from illuminated (BaSr)O cathodes, **549**; initial decay of oxide-coated cathodes, **868**

Hickam, W. M., with C. C. Hein, impurities in Chilean Cu in relation to Cu_2O rectifiers, **1021**

Hickin, E. M., with H. R. L. Lamont, application of molecular resonance to microwave frequency stabilization, **3487**

Higasi, K., and Y. Ozawa, h.f. loss in dielectrics, **707**

Higgins, J., with others, quarter-square multiplier for analogue computer, **1022**

Higgins, T. J., with T. A. Estrin, solution of boundary-value problems by multiple Laplace transformations, **712**

—— with G. W. Swenson, Jr, d.c. network analyser for wave-equation boundary-value problems, **2254**

Higgs, A. J., with others, resonance in gyro interaction of radio waves, **3214**

Higham, J. B., with A. S. Husbands, controlled tripping of h.v. impulse generators, **611**

Higinbotham, W. A., and S. Rankowitz, combined beam-current indicator and integrator, **1939**

Hill, D. M., wide-band converter for signal generator, **1383**

Hill, D. R., new cathode design, **548**

Hiller, J. E., and H. G. Smolczyk, Se content and photoelectric effect of different samples of galena, **3106**

Hillman, K., with others, stabilization of vertical-deflection amplifiers, **1767**

Hines, C. O., wave packets, Poynting vector, and energy flow, **1274**; electromagnetic energy density and flux, **2776**

Hines, M. E., nullification of space-charge effects in converging electron beam by magnetic field, **1466**; equivalent temperature of electron beam, **(D)1780**

Hino, H., with A. Kobayashi, effects of firing temperature on dielectric properties of $BaTiO_3$ ceramics, **1941**

Hintenberger, H., thermal source for negative ions, **1268**

Hirahara, E., Cu_2S semiconductor, conductivity and Hall effect in, **2241**, physical properties of, **2242**

Hirashima, M., secondary-emission valves, **3603**

Hirsch, C. J., W. F. Bailey and B. D. Loughlin, N.T.S.C. compatible colour television, **1750**

Hirsch, J., with W. Ehrenberg, conductivity/temperature characteristics of PbS in O_2, **702**

Hirsh, I. J., and W. D. Ward, recovery of auditory threshold after strong acoustic stimulation, **2418**

Hoadley, H. O., astigmatism correction for oscilloscopes, **1049**

Hoagland, K. A., with others, self-focusing picture tube, **2919**

Hobbs, C. F., close channel spacing at v.h.f. and u.h.f., **2025**

Hobbs, M., British commercial radar, marine, **1924**, anticollision for aircraft, **2815**

Hofbauer, T., and K. M. Koch, mechanism of discontinuities in magnetization, **1272**

Höfer, R., parameters and operation constants of surge waves with different time characteristics, **3488**

Hoff, R. S., and R. C. Johnson, statistical approach to measurement of atmospherics, **1953**

Hoffmann, A., and others, reversible changes in Se rectifiers, **1642**

Hoffmann, E. G., radiation distribution of rhombic aerial with arbitrary termination impedance, **1213**

Hoffmann, G., a.f. amplifiers with adjustable nonlinearity, **26**; distortion analyser for a.f. range, **2106**; harmonic and combination oscillations in ferromagnetic materials, **2454**; low-pass RC amplifier for very low frequencies, **3391**

—— with others, systematic relations between properties of Se/Fe-alloy stampings, **1631**

Hoffmann, R., and J. Müller, carrier-frequency transmission on television cables, **2903**

Hoffmann-Heyden, A. E., with W. Dieminger, reflection of short waves at heights <100 km, **2317**

Hogan, C. L., ferromagnetic Faraday effect with microwaves, the microwave gyrator, **1233**

Hogan, J. V. L., and J. W. Smith, broadcast facsimile, **512**

Hogarth, C. A., conduction properties of CdO and NiO, **700**; crystal diode and triode action in PbSe, **1161**

—— and J. W. Granville, rectification effects at surfaces of Ge and PbS crystals, **1635**

—— with J. W. Granville, thermoelectric effects at surfaces of transistor materials, **161**

Hogg, A. R., air-earth current observations, **408**

Holden, A. N., longitudinal modes of elastic waves in isotropic cylinders and slabs, **884**

Holiday, E. R., and W. Wild, image converter for extending wavelength range of photomultiplier, **1067**

Holland, D. O., I. E. Levy and H. J. Davis, loss of emission in oxide-cathode valves due to shock, **2663**

Holland, J. D., design of radiotelegraph receiving system, **2017**

Holland, L., deposition of h.f. crystal electrodes, **1943**

Höller, P., propagation of e.m. waves from land to sea, **1711**

Hollmann, H. E., polaristors, colloidal suspensions and mixtures used for nonlinear resistors, **2538**, **3150**; nonlinear elements and applications in a.f. and r.f. circuits, **3039**

Holloway, H. R., with others, analysis of dot-sequential colour television, **827**

Hollywood, J. M., with P. C. Goldmark, improving sharpness of television pictures, **828**, **1444**

Holm, E., theory of SiC contact, **3133**

Holm, R., tunnel effect across thin insulator films in contacts, **(C)1017**

Holmes, M. F., with others, life of oxide cathodes in receiving valves, **1781**

Holstein, T., with M. A. Biondi, mechanism of electron-ion recombination, **658**

Holton, G., ultrasonic propagation in liquids under high pressure, **1811**

Holzer, R. E., and D. S. Saxon, distribution of conduction currents near thunderstorms, **2807**

Holzler, E., with H. F. Mayer, developments in transmission of information, **300**

Honda, N., with Y. Watanabe, theory of noise, in transistor, **870**, in crystal rectifier, **3592**

Honda, S., theory and measurement of characteristics of Rochelle salt, **422**; characteristics of various types of piezoelectric vibrators, **3304**

Hönl, H., rigorous formulation of classical diffraction problem, **2182**

—— with E. Groschwitz, diffraction of e.m. waves at a straight slit, **2183**

Honnell, M. A., and M. D. Prince, television-image reproduction by use of v.m. principles, **(D)2630**

Honnell, P. M., transmission matrix stability criterion, **(A)334**

Hontoy, P., measurement of attenuation and characteristic impedance of transmission lines, **3169**

Hood, I. A., video oscillograph for testing distance measuring equipment, **1002**

de Hoop, A. T., with J. P. Schouten, Huyghens' principle in diffraction problems, **2487**

Hopkins, H. G., and F. Horner, rotating H-type Adcock direction finders for m and dm waves, **598**, **(A)1521**

Hopper, A. L., nonsynchronous pulse multiplex system, **3231**

—— with J. R. Pierce, nonsynchronous pulse multiplex system, **3555**

Horak, F. A., correlation of d.c. and μs pulsed emission of oxide cathodes, **2661**

Horinger, C., with others, calculation of height of ionosphere layers from atmospherics waveforms, **990**

Hornbeck, J. A., transient μs currents in pulsed Townsend discharge, **101**

Horner, F., wide-band pre-amplifier for measurements of atmospherics, **1248**; polarization errors in H-type Adcock direction finders, **2812**

—— with H. G. Hopkins, rotating H-type Adcock direction finders for m and dm waves, **598**, **(A)1521**

—— with W. Ross, Radio Research Special Report No. 22, Siting of Direction-Finding Stations, **(B)2227**, **(B)3099**

Horsfield, B. E., with others, subscriber's single-channel v.h.f. R/T equipment, **492**

Horton, C. W., and C. M. McKinney, Jr, radiation patterns and gain of dielectric-rod aerials, **1204**; measurement of λ and attenuation in dielectric waveguides, **1965**

Horton, J. W., fundamentals regarding relative magnitudes, **2259**

Horton, W. F., with E. L. Harder, response time of magnetic amplifiers, **3013**

Hoselitz, K., and M. McCaig, torque curves and magnetic properties of alcomax, **426**, and of other permanent-magnet alloys, **2536**

Hoshino, S., with others, antiferroelectric structure of $PbZrO_3$, **1018**

Hough, G. H., multicathode decade gas-tube counter, **(A)2657**, **2932**

—— and D. S. Ridler, cold-cathode glow-discharge tubes and circuits, **2933**

Houle, J., carrier-type regulated power supply, **1740**

Howe, D. W., Jr, improvement of programme-limiter performance, **539**

Howe, G. W. O., inaugural Clerk Maxwell memorial lecture, **2400**

Howell, W. D., with others, counting system for nucleonics, **610**

Howes, F. S., with T. J. F. Pavlasek, resistors at r.f., **1530**

Hoy, N. A., with others, radiation resistance of resonant transmission lines, **2967**

Hoyaux, M., theory of ionized media with translational symmetry, **331**; application of W.B.K. method to dynamics of linear accelerators, **3301**

Hsu, Pei-Su, graphical analysis for nonlinear systems, **2836**

Hubbard, C. F., with J. B. Smyth, attenuation of radio signals caused by scattering, **(D)1716**

Huber, L., and K. Rawer, test pulse receiver, **(C)364**

Huhl, L., mean winding length, **61**

Huerta, A. F., progressive-wave aerials, **36**; tuning and matching of aerials, **38**

Hueter, T. F., mechanical breakdown of quartz transducers, **305**

—— and E. Dozois, frequency response of $BaTiO_3$ transducers, **1819**

Huffman, D. A., construction of minimum redundancy codes, **3546**

Hufford, G. A., integral equation approach to problem of wave propagation over irregular surface, **2311**

Hug, A., moving-coil measurement instruments, **444**

Huggins, P., direct-reading mains frequency-cycle counter, **2841**

Hughes, J. V., and H. L. Armstrong, dielectric constant of dry air at 3 kMc/s, **3127**

Hughes, R. C., P. P. Coppola and H. T. Evans, chemical reaction in BaO-on-W emitter, **3279**

Hughes, R. W., with others, microwave radio links of Bonneville Power Administration, **3238**

Hugon, J., with others, equipment for Paris-Lille television radio link, **2609**

Hull, H. L., with others, stereo-television in remote control, **1130**

Hull, J. F., inverted magnetron, **3621**

Humphreys, H. R., with T. Somerville, orchestral-studio design, **1508**

Hund, A., High-Frequency Measurements, **(B)746**

Hungermann, E. H., progress in transistor technique, **2365**

Hunt, F. V., enhancing the space resolution of directional receivers, **790**

Hunt, G. L., quality and reliability standards for Service valves, **1777**

Hunt, L. E., and W. J. Albersheim, c.r.o. scanner for measurement of delay distortion, **2286**

Hunter, G. T., modern digital computers, **3483**

Hurley, H. C., S. R. Anderson and H. F. Keary, Civil Aeronautics Administration v.h.f. omnirange aid, **1000**, **(C)2814**

Huron, R., with others, new construction principle for analogue computers, **2256**

Husbands, A. S., and J. B. Higham, controlled tripping of h.v. impulse generators, **611**

Husmann, H., musical work of art in electrical transmission, **3325**

Husson, R., neuropsychological relations between phonation and hearing, **1194**; room acoustics from point of view of singer and speaker, **2103**

Hutchinson, G. W., and G. G. Scarrott, pulse-height analyser of moderately high speed, **604**

Hutchinson, W. C. A., point-discharge currents and earth's electric field, **1304**

Hutton, J. A., television ghosts due to multipath propagation in hilly country, **1765**; focusing c.r. tubes for television receivers, **3258**

Huxley, L. G. H., conductivity of gas containing free electrons, **1266**

Hyam, E. D., and J. Nutting, electron- and optical-microscope examination of identical areas, **3523**

Hyde, F. J., selective amplification at low frequencies, **1563**

Hyde, N. E., electro-ceramics, pyrophyllite, **1016**

I

Ibaraki, Y., with M. Ishida, electron oscillation in reflex klystron, **879**

Ibing, H. K., television in Germany, **1442**

Icole, J., and J. Oudin, time analysis and filtering, **2322**

Iglück, L., electrical loudspeakers, **2701**

Ikeuchi, J., with S. Uda, klystrons, effects of grid mesh on performance of, **878**, equivalent networks of, **1481**

Illner, O., repeater coil with divided secondary and single resonance peak, **1548**

Iltis, J., with J. Selz, measurement of group propagation time differences on a non-looped line, **1373**

Infeld, L., is there an aether?, **(D)2769**

Ingård, U., and R. H. Bolt, absorption characteristics of acoustic material, **311**, free-field method of measuring, **309**

—— and D. Pridmore-Brown, sound propagation in duct with constrictions, **1492**

Inselmann, K., and L. Stöckmann, measurements of Hall effect in ZnO, **2825**

van Iperen, B. B., v.m. valves for 100–1000-W continuous output, **2953**

Isaacs, G., with others, sealing sapphire to glass for photocells, **179**

Isberg, R. A., directional operation for KRON-TV, **40**

Isborn, C., ferroresonant flip-flops, **1852**

Ishida, M., and Y. Ibaraki, electron oscillation in reflex klystron, **879**

Ishikawa, K., with T. Hibi, thermionic emission from illuminated (BaSr)O cathodes, **549**; initial decay of oxide-coated cathodes, **868**

Ishikawa, Y., and others, p-n transition in (BaSr)O cathode, **1472**

Israël, H., fundamental ideas on atmospheric electricity, **409**

—— H. W. Kasemir and K. Wienert, diurnal variations of atmospheric electricity in the high Alps, **991**

van Itterbeek, A., L. de Greve and F. Heremans, resistivity measurements on thin Fe films, **2238**

—— and others, measurements of resistance variation with current for condensed Fe films at low temperatures, **2828**

Ivey, H. F., space charge and transit time in diodes for relativistic velocities, **2383**; space-charge-limited currents between inclined plane electrodes, **2384**

J

Jackson, W., world-wide simultaneous magnetic fluctuations and relation to sudden commencements, **1908**

Jacob, L., current in electron immersion objective, **3520**

—— with J. R. Shah, field distribution in symmetrical e.s. electron lens, **1396**

Jacobs, H., J. Martin and F. Brand, secondary emission from composite surfaces, **2198**

Jacot, J., radio-diffusion amplifiers for standard telephone circuits, **2468**

Jaffe, B., with others, properties of $Be/BaTiO_3$ dielectrics, **708**

Jaffé, G., theory of conductivity of semiconductors, **2193**

de Jager, C., M. Minnaert and C. A. Muller, absence of H 1420-Mc/s line from solar r.f. radiation, **977**

de Jager, F., with others, delta modulation, **2603**

Jähnig, G., work function for oxide cathodes, **1156**

Jain, S. C., and K. S. Krishnan, thermionic constants of graphite, **3467**

Jakes, W. C., Jr, and A. B. Crawford, selective fading of microwaves, **1413**

James, E. G., and G. M. Wells, crystal triodes, **3268**

Jamgochian, E., with others, 'injected' light emission from SiC crystals, **154**

Jancovici, B., with others, semiconducting properties, of Te, **3450**, of molybdenite, **3454**

Janes, R. B., with others, performance of vidicon television camera tubes, **2914**

Jankovsky, R., with A. Troost, recent goniometer developments, **140**

Jansen, C. G. J., with R. Loosjes, anomalous distribution of velocities of electrons emitted by pulsed oxide cathode, **2380**

—— with others, thermionic emitters under pulsed operation, **3600**

Janssen, J. M. L., discontinuous low-frequency delay line with continuously variable delay, **2142**

—— and L. Ensing, electro-analogue for studying regulating systems, **458**

Jansson, W., with W. A. Prowse, electrical breakdown of gases at 2·8 kMc/s, **850**, **2774**

Jeannin, R., with others, equipment for Paris-Lille television radio link, **2628**

Jekelius, K., internal capacitance of multilayer coil, **342**

Jenkins, I., with D. M. Dovey, review of electric furnaces, **1387**

Jenkins, J. A., and R. A. Chippendale, image-converter tubes, application to high-speed photography, **1693**, applications of, **2864**

Jenny, H. K., 7-kMc/s magnetron for f.m., **3295**

Jensen, A. G., Davisson c.r. television tube, **1142**

Jenssen, G., and A. Sunde, pulse-height analyser for time-interval measurements, **3157**

Jepsen, R. L., and M. W. Muller, enhanced emission from magnetron cathodes, **1176**

Jessel, M., radiation from aerial inside rectangular waveguide, **1199**

Jesty, L. C., and N. R. Phelp, television picture quality, **275**, **(C)1126**, **1127**, **2920**

Jochems, P. J. W., and F. H. Stieltjes, apparatus for testing transistors, **2558**

Johler, J. R., with H. V. Cottony, cosmic radio-noise intensities in v.h.f. band, **3421**

John, U., theory of linear electromechanical quadripoles, **621**

Johnson, C. B., with S. Wagener, calibration of ionization gauges, **1004**

Johnson, C. M., R. Trambarulo and W. Gordy, microwave spectroscopy at 2–3-mm λ, **1886**

Johnson, C. R., with L. J. Anderson light-weight pickup and tone arm, **888**

Johnson, E. O., and J. D. Callaghan, aerials for u.h.f. television reception, **1517**, **1840**

—— and W. M. Webster, plasmatron, **2659**

—— with others, hot-cathode arcs, discharge modes for, **959**, anode-glow mode of, **3068**
Johnson, F. S., and others, atmospheric ozone distribution to 70 km height, [illegible]
Johnson, H., and K. R. Deremer, gas-discharge u.h.f. noise sources, **185**
Johnson, H. R., and M. W. P. Strandberg, beam system for reduction of Doppler broadening of microwave absorption line, **2207**
Johnson, R. A., with others, statistical errors in measurements of random time functions, **2843**
Johnson, R. C., with R. S. Hoff, statistical approach to measurement of atmospherics, **1953**
Johnson, S. J., and T. F. Rogers, magnetically induced ultrasonic velocity changes in multicrystal Ni, **2818**
Johnson, S. W., with others, compensation in television film reproduction, **1443**
Johnston, H. R., C. A. Hermanson and H. L. Hull, stereo-television in remote control, **1130**
Johnstone, G. G., with S. W. Amos, sensitive tuned-r.f. receiver, **1092**
Jones, D. A., with others, infrared transmission of galena, **703**
Jones, D. S., diffraction of e.m. wave by waveguide of finite length, **2185**
Jones, E., scanning and h.v. circuits for wide-angle picture tubes, **2351**
Jones, E. H., propagation of v.h.f. radio waves, **1712**
Jones, E. M. T., internal-feedback travelling-wave-valve oscillator, **2373** annular corrugated-surface aerial, **2442**
Jones, F. L., physics of electrical discharge, **99**
—— and D. E. Davies, secondary ionization in low-pressure breakdown in H, **102**
—— and G. D. Morgan, h.f. discharges, breakdown mechanism and similarity relation, **378**, similarity relation for minimum maintenance potentials, **379**
—— and A. B. Parker, mechanism of spark breakdown in air, **3405**
—— and E. T. de la Perrelle, cold emission of electrons in spark gaps, **98**
—— with others, mechanism of spark breakdown in N, **3404**
Jones, G. E., Jr, analysis of split-load phase inverter, **1848**
Jones, G. O., and F. F. Roberts, spontaneous magnetization of Mg ferrite and Mg ferrite-aluminate powders at low temperatures, **3120**
Jones, H. L., and P. N. Hess, identification of tornadoes by observation of atmospherics waveform, **3429**
Jones, M. W., winter thickness of F layer in polar regions, **676**
Jones, R. V., design of optical levers and amplifiers, **201**
—— and C. W. McCombie, Brownian fluctuations in galvanometers and galvanometer amplifiers, **2280**
—— with others, infrared transmission of galena, **703**
Jong, A. S., with G. F. Burridge, coordination of power-line carrier network, **(A)1102**
Jonker, G. H., with H. J. van Santen, piezoelectric properties of $BaTiO_3$, **1624**
Jonker, J. L. H., angular distribution of secondary electrons from Ni, **1769**; theory of secondary-electron emission, **2197**
—— and Z. van Gelder, switch tubes for communication equipment, **1173**, **1789**
—— and P. W. Haaijman, wire capacitor and other composite drawn products, **1853**
—— A. J. W. M. van Overbeek and P. H. de Beurs, decade-counter valve for high counting rates, **3614**
Jordan, E. C., Electromagnetic Waves and Radiating Systems, **(B)599**
Jordan, J. P., Ge crystals, **3452**
Jouvet, B., classic theory of point charge, **2188**; new theory of electromagnetism, **2201**; physics of e.m. universe, **2767**
Joyce, J. W., Transactions of Oslo Meeting of I.U.G.G., 1948, **669**
Joyet, G., and W. Mauderli, medical applications of 31-MeV betatron, and shielding problems, **1996**
Junger, M. C., radiation loading of cylindrical and spherical sources, **2680**; sound scattering by thin elastic shells, **3299**
Jungnickel, H., and H. Falkenhagen, coaxial line as measurement instrument in dm-wave band, **1369**

K

Kaden, H., advances in theory of waves on wires, **908**; general theory of helical line, **1893**
Kafka, H., conductance diagram for transformers, **2131**
Kahan, T., and G. Eckart, surface wave in dipole radiation over plane earth, **(D)469**; propagation of e.m. waves in atmospheric duct, **1402**
—— with G. Eckart, 'internal' reflection in stratified medium, and application to troposphere, **236**
Kahn, L. R., s.s.b. transmission by envelope elimination and restoration, **2925**
Kaiser, H., with H. Rukop, natural frequencies of coupled circuits, **78**
Kaiser, T. R., r.f. requirements of high-energy electron synchrotrons, **222**
—— and R. L. Closs, theory of reflection from meteor trails, **2208**
Kallmann, H., and B. Kramer, induced conductivity and light emission of (Zn:Cd)S phosphors, **3438**
Kamen, I., and R. H. Dorf, TV Master Antenna Systems, **(B)2126**
Kamiyoshi, K., low-frequency dispersion in Ni and Co ferrites, **1328**
Kaneko, H., with T. Sato, physical properties of Se, **1336**; characteristics of Se rectifiers, **2340**
Känzig, W., and N. Maikoff, magnetism of free charge-carriers in semiconductors, **1821**; transition of $BaTiO_3$ at 120C°, **1342**
Kaplan, S. M., and R. W. McFall, application of noise statistics to radar-range performance **(D)2221**
Karolus, A., development of storage-type television camera tubes, **2349**
Karp, S. N., Wiener-Hopf techniques and boundary-value problems, **1572**
Kasemir, H. W., studies of atmospheric potential gradient, **407**; recorder for atmospheric potential gradient and air-earth current, **1028**
—— with others, diurnal variations of atmospheric electricity in the high Alps, **991**
Kasteleijn, P. W., lowest energy state of a linear antiferromagnetic chain, **2199**
Katsura, S., with Y. Watanabe, cut-off characteristic and potential distribution of magnetron, **2069**
—— with others, equation of thermionic emission of oxide-coated cathode, **2083**
Katz, H., and K. L. Rau, thermionic data for some capillary metal cathodes, **1156**
Kaufman, A. B., effect of magnetic field on Ge diode, **3604**
Kaufmann, A., conditions of validity of matrix analysis for quadripole assemblies, [illegible]
Kazan, B., and M. Knoll, processes in charge-controlled storage tubes, **2668**
Kazantseva, M. V., calibration of transducers by reciprocity method, **2689**
Keall, O. E., noise factor of networks, **2140**
Kealy, W. A., with R. S. Medlock, self-balancing instruments in nucleonics applications, **1037**
Keary, H. F., with others, Civil Aeronautics Administration v.h.f. omnirange aid, **1000**, **(C)2814**
Keck, P. H., photoconductivity of Se films, **3104**
Keen, A. W., scanning-current linearization by negative feedback, **1752**; positive-feedback operator networks, **3372**
Kegel, K., equipment for inductive surface hardening, **3193**
Keister, J. E., television broadcasting aerials, **1208**
Keith, W. W., and H. N Beveridge, piezoelectric transducers for ultrasonic delay lines, **2743**
Kelleher, K. S., and H. H. Hibbs, organ-pipe radar scanner, **1920**
Keller, K. J., breakdown and conductivity of glass, **1348**
Kelley, A. A., remote-pickup receiver for broadcasting studio, **480**
Kelley, G. G., pulse-amplitude analysers for spectrometry, **3010**
Kelly, S., thorn needles, **(D)2422**
Kelso, J. M., wave propagation at oblique incidence and Lorentz polarization term, **1302**
Kemp, P., waveform analysis for odd harmonics up to eleventh, **1374**
Kempf, R. A., coaxial impedance standards, **186**
Kendig, P. M., with D. T. Laird, attenuation of sound in water containing air bubbles, **1812**
Kent, G. J., test set for mobile transmitters, **1054**
Kenworthy, R. W., and T. D. Burnam, absorption coefficients of fir plywood panels, **310**
Kerbel, H., diagrams for ganging calculations, **53**
Kerker, M., with A. L. Aden, scattering of e.m. waves from two concentric spheres, **1259**
Kerkhof, F., and W. Werner, Fernsehen, **(B)2643**
Keroes, H. I., with D. Hafler, ultralinear a.f. amplifier, **1512**
Kerr, D. E., Propagation of Short Radio Waves, **(B)478**
Kerr, F. J., possibility of radar echoes from sun and planets, **2513**
Kerwien, A. E., modulation equipment for s.s.b. transmitters, **2926**
Kessler, J. A., with others, assessment of speech-reinforcement systems, **572**
Kessler, W. J., and S. E. Smith, expressions for reduction of distortion and output impedance in terms of db of feedback, **1566**
—— with S. E. Smith, cathode followers in series for high impedance-transformation ratios, **945**
—— with W. F. Zetrouer, similarity of atmospherics waveforms, **678**
Ketchledge, R. W., induction-heater control system, **1064**
Kettel, E., nonlinear crosstalk in multichannel u.s.w. f.m. links, and specifications for cable connections, **1429**; effect of aerial-feeder mismatch on distortion in f.m. transmission, **2602**; master oscillator for u.s.w. f.m. broadcasting transmitters, **2647**
de Keuster, F., with others, dielectric constant of diamond, **3143**
Keyes, R. W., electrical conductivity of liquid Ge, **1338**
Khastgir, S. R., S. K. R. Tolpadi and S. C. Mitra, volume rectification in zincite, **158**
—— with P. M. Das, random fading of s.w. signals, **1088**
Khin, L. S., with others, electron-optical systems with apertures deviating from ideal, **1076**
Khodakov, A. L., with others, dielectric properties of TiO_2, **1345**
Kholodenko, L. P., and M. Ya. Shirobokov, ferroelectric properties of $BaTiO_3$-type crystals under elastic stress, **3445**
—— with M. Ya. Shirobokov, thermodynamic theory of ferroelectric properties of $BaTiO_3$-type materials, **3444**
Khorosh, D. M., secondary-electron multiplier with Al_2O_3-Cs emitters, **1160**
Kidd, M. C., with M. S. Corrington, amplitude and phase measurements on loudspeakers cones, **312**
Kiely, D. G., path-length microwave lens, **50**; dielectric lens for marine radar, **327**
—— and W. R. Carter, fading of 3-cm waves over 10·6-mile sea path, **1717**
—— with H. A. Gebbie, dielectric constant and loss of amorphous Se at 3-cm λ, **3466**
Kiepenheuer, K. O., emission of corpuscles from the sun, **2494**
Kihlberg, G., with others, integrating amplifier for c.r.o recording of magnetic flux, **2276**
Kikuchi, M., with others, a.c. characteristics of Si *p-n* junctions, **1323**
Kikuchi, T., transient eddy-current phenomena in saturable-reactor cores, **1**[illegible]
Kikuchi, Y., electrostriction theory, **3446**
—— and K. Fukushima, theory and design of laminated magnetostriction vibrators, **302**
—— and H. Shimizu, hysteresis losses in magnetostriction oscillator, **303**; attenuation of electroacoustic transducers for case of conjugate matching, **3305**; attenuation of ring-type magnetostriction transducer, **3306**
Kilburn, T., digital computer at Manchester University, **184**
—— with others, universal high-speed digital computer, circuits for, **2838**, magnetic store for, **2840**
Kilpatrick, E. L., polarization measurements of l.f. echoes, **2874**
Kilvington, T., transmission of television signals over telephone lines, **822**
—— F. J. M. Laver and H. Stanesby, London-Birmingham television-cable system, **2625**
King, A. J., with others, developments and simplifications in permeameters, **3499**
King, A. P., transmission characteristics of round waveguide, **2992**
King, D. D., dielectric image line, **2994**
—— with S. H. Dike, gain and back-scattering cross-section of cylindrical aerial, **2716**
King, G., with others, 1-MeV linear electron accelerator, **1068**
King, R., theory of V-aerials, **918**; dipole aerials, Zuhrt's theory of, **(D)920**, with tuned parasitic radiator, **1202**; self and mutual impedances of parallel aerials, **2999**; improved theory of receiving aerial, **3351**
—— with J. E. Storer, radiation resistance of 2-wire line, **577**
—— with others, measurement of aerial impedance using receiving aerial, [illegible]
King, R. B., with others, dielectric constant and electron density in gas discharge, **651**
Kingsbury, E. F., and R. S. Ohl, photoelectric properties of ion-bombarded Si, **2929**
Kinne, E., timebase for television receivers, **841**
Kip, A. F., with others, M.I.T. linear electron accelerator, **2295**
Kirby, R. S., J. W. Herbstreit and K. A. Norton, service range for aircraft communication at frequencies > 50 Mc/s, **2616**
Kirke, H. L., R. A. Rowden and G. I. Ross, field-strength survey for Wrotham 90-Mc/s transmitter, **240**
Kirschner, U., capacitor microphone, input resistance of, **18**, design of amplifier input circuit for, **637**; negative-feedback amplifiers, **952**; generalized network theory, **(C)2151**; treatment of transient phenomena by Laplace transformation, **3360**
Kirschstein, F., theory of deflection systems for television tubes, **528**
Kirschstein, —, television at C.C.I.R. meeting, Geneva, 1951, **2050**
Kitai, R., pulse response of a.m. receiver, **1418**, **(A)2379**
Kitchen, F. A., omnidirectional aerial for naval use at 225–400 Mc/s, **593**
Kitchenn, R. G., 8-channel transmitter for carrier wire-broadcasting system, **798**
Kittel, C., domain-boundary motion in ferroelectric crystals, **156**
—— with Y. Yafet, antiferromagnetic arrangements in ferrites, **3414**
Klahr, C. N., resistivity and Hall constant of semiconductors, **(C)170**
Kleen, W., noise in v.m. valves, **2372**; calculation of noise figure of travelling-wave valves, **3597**
—— and W. Ruppel, delay line as valve component, **2375**; calculation of noise figure of travelling-wave valves, **3276**
Klein, C., ionization in incandescent gases of jet-propulsion mechanisms, **1269**
Klein, G., analysis and construction of position-fixing servomechanism, **1739**; generalization of random-walk problem and simple model of Brownian motion, **3052**
Klein, J. A., and others, magnetron harmonics at mm λ, **2478**
Klein, S., high-power thermionic cell with superposed h.f. field, **298**; Ionophone, ionic loudspeaker, **896**, **3329**, physical principles of, **897**
Klein, W., effect of circular apertures in cavity-resonator walls, **632**; frequency converters as quasilinear quadripoles, **2166**; equivalent circuits of the nonreversible quadripole, **3031**
—— with H. Döring, resonance-resistance measurements at cm λ, **1959**; cavity band-pass filters for cm waves, **2149**; applications of window coupling at cm λ, **2158**
Kleinwächter, H., wave propagation in horns, **390**, **915**; travelling-wave valve without delay line, **2075**; expansion of space-charge clouds, **2870**; universal method of calculating radiation characteristics by Kirchhoff's formula, **3000**
—— and H. Weiss, flexible two-wire line for u.h.f. transmission, **2113**
Klemperer, O., test for spherical aberration of electron lenses, **1075**
Klemt, A., h.f. response-curve tracer for 100 kc/s–230 Mc/s, **3509**
Klenk, L. M., A. J. Munn and J. Nedelka, multichannel s.s.b. radio transmitter, [illegible]
de Klerk, J., effect of magnetic field on ultrasonic propagation in ferromagnetic materials, **1805**
Kline, M., asymptotic solution of Maxwell's equations, **646**
Klinger, H. H., radio waves and astronomy, **1278**
Kloepfer, W., with J. Meixner, theory of annular-slot aerials, **323**
Klopfenstein, R. W., transmission-line tuning stubs for minimum dissipation, **315**
von Klüber, H., observations in Sudan of solar eclipse 25th Feb. 1952, **3077**
Kneissler, L., air-gap field of permanent magnets, **963**
Kneser, H. O., damping of vibrating rods by surrounding medium, **645**
Kniel, E., with A. Kolarz, problems of automatic operation of transmitter groups, **2648**
—— with others, radio common-wave system of the Südwestfunk, **2618**
Knol, K. S., determination of electron temperature in gas discharges by noise measurements, **1465**
Knoll, M., with B. Kazan, processes in charge-controlled storage tubes, **2668**
Knöpfel, W., with E. Bauermeister, u.s.w. field strength predictions for mountainous terrain, **2584**
Knudsen, H. L., directive ring aerial arrays, **1518**; radiation field of square helical beam aerial, **2726**
Knudsen, J. A., with R. G. Medhurst, power meter and mismatch indicator, **(D)1680**
Knudson, L. L., design of reactors for radio-interference filters, **3019**
Kobayashi, A., and H. Hino, effects of firing temperature on dielectric properties of $BaTiO_3$ ceramics, **1941**
Kobrak, H. G., physiological aspects of directional hearing, **1186**
Koch, B., frequency measurement in microwave range, **3173**
Koch, K. M., with T. Hofbauer, mechanism of discontinuities in magnetization, **1272**
Kock, W. E., and F. K. Harvey, photographic display of sound-wave and microwave fields, **3**
Koda, T., with others, considerations on space-charge equation, **3591**
Kodis, R. D., diffraction measurements at 1·25-cm λ, **2186**
—— and R. Shaw, crack detector for gun barrels, **454**
de Koe, H. S., tracking of superheterodyne receivers, **483**
Kogan, S. Kh., excitation of a helical conductor, **112**
Koike, Y., and S. Yamanaka, triodes, electron transit-time reduction in, **871**, microwave, amplification factor of, **3287**
Kojima, Y., with others, ferromagnetic resonance in Co ferrite at high temperature, **1327**
Kok, J. A., e.s. plasma oscillations in metals, **1264**
Kolarz, A., and E. Kniel, problems of automatic operation of transmitter groups, **2648**
—— and B. Fick, u.s.w. frequency converter for relay station, **2646**
—— E. Kniel and K. H. Baer, radio common-wave system of the Südwestfunk, **2618**
—— A. Schweisthal and K. H. Baer, Ravensburg 2 × 20-kW broadcasting transmitter, **2644**
Kolb, O. K., magnetic sound recording and applications, **2961**
Koll, R. T., with others, pressure, density and temperature of atmosphere, **2506**
Koller, L. R., and E. D. Alden, electron penetration and scattering in phosphors, **152**
Kolscher, M., harmonic analysis of distorted oscillation after amplitude limiting, **193**
Komagata, S., and others, a.c. characteristics of Si *p-n* junctions, **1323**
Kompfner, R., with F. N. H. Robinson, noise in travelling-wave valves, **546**
Kondorski, E., coercive force and magnetic susceptibility of ferromagnetic powders, **3116**
Konosenko, I. D., with others, electrical properties of thin layers containing grey tin, **2889**
Koops, C. G., resistivity and dielectric constant of semiconductors, **168**
Kopelman, B., permanent magnets from ultrafine iron powder, **3151**
Koppelmann, J., ultrasonic measurement technique in fluids, **2967**
Köppen, H., measurement of extremely small valve grid currents, **1166**; radio communication on short waves, **3226**; penetration-factor determination for amplifier valves, **3285**
Körner, H., and W. Stöhr, wide-band aerial for u.s.w. beam links, **3354**
Kornfeld, J., new directional radio links, **266**
Kornhauser, E. T., radiation field of helical aerials with sinusoidal current, **596**
Kornstein, E., with others, image-orthicon colour-television camera optical system, **2907**
Koros, L. L., frequency control of modulated magnetrons by resonant injection system, **2783**
Kosmahl, H., with R. Gebauer, variation of h.f. power of drift-space valve, **2391**
Kosten, L., theory of f.m. signals in linear networks, **3049**
Kösters, H., quality of broadcasting transmissions. **3541**
Kouvelites, J. S., and L. W. McKeehan, magnetostrictive vibration of Ni-Fe and Ni-Cu spheroids, **3458**
—— with others, magnetrostrictive vibration of prolate spheroids, **1929**
Kozhevnikova, N. V., and A. I. Medovoi, ferroelectric properties of tantalates and niobates of alkali metals, **3111**
—— with G. A. Smolenski, origin of ferroelectricity, **155**
Kozlovski, V. Kh., effective fields in $BaTiO_3$, **3137**
Kramer, B., with H. Kallmann, induced conductivity and light emission of (Zn:Cd)S phosphors, **3438**
Kramers, H. A., quantum theory of antiferromagnetism, **2200**
Krasnogorskaya, N. V., 'mosaic' multiplier as magnetic-field indicator, **284**
Krause, L. O., side-fire helix u.h.f. television transmitting aerial, **44**
Krause, W. A., portable R/T equipment for communication between ship and port, **3553**
Krauss, H. L., with P. F. Ordung, response speed of cathode-coupled clipper circuit, **941**
Krauss, S. L., and C. J. Tennes, electronic-organ tone generators, **905**
Kresser, J. V., bevatron power plant, **3196**
Kretzmer, E. R., statistics of television signals, **2904**
Kreuzritter, M., test equipment for modulated currents, **443**
Krieg, M., and E. Lange, electroluminescence in anodic polishing of Zn, **3055**
Krinchik, G. S., with N. S. Akulov, eddy currents due to displacement of domain boundaries, **3115**
Krishnan, K. S., with S. C. Jain, thermionic constants of graphite, **3467**
Krivoglaz, M. A., and K. B. Tolpygo, contact resistance and contact potential difference, **2194**
Kröger, F. A., with E. J. W. Verwey, oxidic semiconductors and ZnS phosphors, **1625**
Kronjäger, —, Hamburg meeting of committee for radio navigation, **3093**
Krumbein, A. D., self-quenching counters containing small amounts of polyatomic gas or vapour, **1704**
Kubo, R., thermal ionization of trapped electrons, **3449**
Kuder, M. L., valve-curve generator, **1677**
Kuettner, J., electrical and meteorological conditions in thunderclouds, **1607**
Kuhl, W., with E. Meyer, geometrical room acoustics, **2974**
Kühn, R., Siemens Se rectifiers and design of suitable transformers and chokes, **505**; characteristics of Type-SSF Se rectifiers and resistance of associated transformers, **3363**
Kuhner, M., and P. Lapostolle, technical development of travelling-wave valves Types M8 and M11, **2936**
Kulp, M., Elektronenröhren und ihre Schaltungen, **(B)2093**; interference, in f.m. and a.m. reception, **2325**, in f.m. reception caused by strong unwanted stations, **2886**
Kundu, P., RC-tuned oscillators, **(D)3381**
Kuntzmann, J., J. Daniel and Min-Yuan Ma, stability of control systems, **2619**
Küpfmüller, K., electrical-equivalent circuits, **601**; channel capacity and system transit time, **3543**
—— with G. Buchmann, progress in development of electrodynamic loudspeakers, **19**
Kuris, A., ultrasonic method of producing holes in hard materials, **1968**
Kuritsyna, E. F., temperature dependence of magnetic viscosity of ferromagnetic metals, [illegible]
Kuykendall, J. H., valve-curve tracer, **1678**
Kwal, B., energy losses of particles in plasma, **1267**; e.m. radiation by electron collisions in strongly ionized medium, **2780**
Kwasieborski, J., measurement of ignition delay in i.c. engines, **224**

L

Labhart, H., velocity of sound in porous media, **2968**
Laborderie, J., reflex klystron with fixed load and wide frequency range, **2392**
Labrum, N. R., and E. K. Bigg, r.f. oscillations in low-pressure discharge tubes, **3064**
Labus, J., optimum amplification in travelling-wave valve, **2374**
Laemmel, A. E., N. Marcuvitz and A. A. Oliner, approximation methods in radial-transmission-line theory, **29**
Laett, H., pulse discrimination by means of transit-time elements, **2129**; variant of frame synchronizing sequence of C.C.I.R. 625-line standard, **2631**; Uetliberg as television transmitter site, **3254**
Lafferty, R. E., with J. L. Hathaway, aural monitor for f.m. transmissions, **2601**
Laffineur, M., and others, observations of solar eclipse, 25th Feb. 1952, **2785**
Lafoucrière, J., with A. Moussa, vector potential of rotationally symmetrical magnetic field, **111**
LaGow, H. E., with others, pressure, density and temperature of atmosphere, **2506**
Lagrenaudie, J., contact rectification with Te, **3131**; rectification effects with molybdenite and tungstenite, **3147**
LaGrone, A. H., scattered radio waves, volume integration of, **1412**, **(C)2586**, cross polarization of, **3537**; attenuation of radio signals caused by scattering, **(D)1718**

Laird, D. T., and H. Cohen, acoustic radiation patterns for finite source on rigid cylinder, 1809
—— and P. M. Kendig, attenuation of sound in water containing air bubbles, 1812
Lajeunesse, [illegible], and M. Cambornac, stabilization of d.c. servomechanisms, 1738
Lamb, J. J., with others, elimination of r.f.-heater television interference, 1144, 1459
Lambert, R., with others, measurements of resistance variation with current for condensed Fe films at low temperatures, 2828
Lamberts, K., wide-band omnidirectional aerials with horizontal polarization for m and dm waves, 919; h.f. impedance measurement using bridged-T and parallel-T elements, 1665
Lamont, H. R. L., frequency stabilization by microwave absorption, 1850
—— and E. M. Hickin, application of molecular resonance to microwave frequency stabilization, 3487
Lamoral, R., with J. Pujolle, f.m. in architectural acoustics, 3317
Lampert, M. A., with others, magneto-optics of electron gas for microwaves, 912, (C)913, 914
Lance, T. M. C., large-screen television in Telecinema, 1131
van Lancker, M., generalized theory of induction heating, 216
Landauer, R., electrical resistance of binary metallic mixtures, 3447
Landecker, K., possibility of frequency multiplication and wave amplification by relativistic effects, 3383
—— with others, resonance in gyro-interaction of radio waves, 3214
Lander, G., design of i.f. stage in superheterodyne receivers, 2019
Landmark, B., polarization of radio waves reflected from ionosphere, 2887
Landsberg, M., penetration factor of triodes, 1474
Landsberg, P. T., diffusion theory of rectification, 3402; general theory of barrier-layer rectifiers, 3472
Lane, J. A., and J. A. Saxton, dielectric properties of water and methyl and ethyl alcohols at u.h.f., 3399
—— with A. C. Grace, surface-wave transmission line, 3338
—— with J. A. Saxton, electrical properties of sea water, 3424
Lang, A. R., printing recorder for use with scaling units, 3524
Lang, G., h.f. heating, fundamentals of, 215, economics and applications of, 457
Lange, E., with M. Krieg, electroluminescence in anodic polishing of Zn 3055
Lange-Hesse, G., double refraction in crystals and in ionosphere, 2868; analysis of variations of ionospheric absorption, 3538
Langer, R. E., asymptotic solutions of differential equation in theory of microwave propagation, 1710
Langevin, M., and G. Allart, 10-channel pulse-amplitude analyser, 2130
Langille, R. C., and R. S. Thain, measurement of 3-cm radar echoes from falling snow, 1613
Langton, N. H., with N. Davy, field inside semi-infinite slot with semicylindrical bottom, 3071
Lansard, R., electrical analogue of motor-car suspension system, 1060
Laplume, J., m.f. amplifiers with reduced phase distortion, 951
—— and others, equipment for Paris-Lille television radio link, 2623
Laport, E. A., design data for horizontal rhombic aerials, 2728
Laporte, H., piezoelectric vibration galvanometer, 2851
Lapostolle, P., with M. [illegible], technical development of travelling-wave valves Types M8 and M11, 2936
Lapp, D. N., Pennsylvania turnpike u.h.f. communication system, 1730
Lark-Horovitz, K., with others, neutron bombardment of Ge, effect of, 163, production of hole traps by, 1637
Larris, F., with J. Hartmann, air-jet generator for waves in liquids, 300
Latham, D., and B. D. Power, vacuum technique and its application in radio and electronics, 1328
Latham, R., M. J. Pentz and M. Blackman, coil system for air-cored betatron, 2566
Lathrop, R. C., with others, study of oscillator circuits by analogue-computer methods, 943
Latscher, F., modern permanent magnets and their application, 3152
Launer, D. M., producing and interpreting the pulse cross, 1125
Laurent, T., theory of transmission time and build-up time in filters with phase distortion, 2465
Lauter, E. A., and K. Sprenger, nocturnal ionization disturbances in lower ionosphere, 3426
Lavagnino, B., current harmonics in dielectrics, 344; applications of single-T and double-T networks, 3032
Laver, F. J. M., with others, London-Birmingham television-cable system, 2625
Lavatelli, L., with others, dee-bias system for f.m. cyclotron, 762
Laville, G., graphical method for harmonic analysis and symbolic calculus, 2779
Law, H. B., 3-gun shadow-mask colour kinescope, 844
Law, R. R., 1-gun shadow-mask colour kinescope, 845
Lawden, D. F., general theory of sampling servo systems, 811
Lawhead, R. B., and I. Rudnick, acoustic wave propagated along boundary, 296, 297
Lawley, L. E., sound propagation through gases in narrow tubes, 2408
Lawrance, R., photovoltaic effect in natural PbS, 1930
Lawson, W. D., oxygen-free single crystals of PbTe, PbSe and PbS, 2830
—— with others, long-wave limit of PbSe photocells, 1771
Lax, M., multiple scattering of waves, 1578
Learned, V., klystron for air-navigation systems, 9·3-kMc/s, 1482; Type SAL39 power-amplifier, 2092
—— and C. Veronda, recent high-power klystron amplifiers, 2393
Le Bel, C. J., measurement and analysis of intermodulation, 336
Leblanc, M., La Technique du Vide, (B)180
Le Bot, J., with S. Le Montagner, abac for dielectric constant at cm λ, 1367
Lebrun, A., chart for permittivity determination at u.h.f., 2270
—— and R. Arnoult, coaxial-line permittivity measurements at m and dm λ, 1956
LeCaine, H., Q measurement of microwave cavity by comparison with calibrated h.f. circuit, 1960
Le Couteur, K. J., Dirac's new electrodynamics, (D)2208
Le Croissette, D. H., and J. Yarwood, characteristics of Br-quenched G-M counters, 767
Ledbetter, R. P., tape editing and duplicating equipment, 1823
Ledinegg, E., and E. Fehrer, theory of cavity-resonator measurement of permittivity in cm-wave range, 442
—— and P. Urban, natural oscillations of cylindrical resonators with stratified dielectric, 1242, results from theory of coupled cavity resonators, 1550; determination of loss angle of materials with high dielectric constant, 1666; completeness of system of E- and H-type waves in waveguides, 2433
—— P. Urban and F. Reder, measurement of dielectric constant of fluids at cm λ, 1664
Lee, E. W., magnetic properties of Si-Fe alloys, 3464
Lee, Y. W., T. P. Cheatham, Jr, and J. B. Wiesner, application of correlation analysis to detection of periodic signals in noise, (D)479
Lee, V. E., with others, magnetic modulators, 1528
Legrand des Cloizeaux, J., with others, semiconducting properties of Te, 3450
Legros, R., measurement of capacitor charging current by moving-coil galvanometer, 2281
Legvold, S., with [illegible], d.c. resistance of Se and Cu_2O rectifiers at 70°–300°K, 2821
Lehan, F. W., probability of axis crossing for increasing-signal plus noise, 715
Lehmann, G., amplifying dynamos in servomechanisms, 2690, 3240
Lehmann, H., predicting magnetic-amplifier control curves, (A)3012
Lehmann, R., with P. Chavasse, noise abatement in offices of Administration française des P.T.T., 1816; standardization of hearing aids and test methods, 3336
Lehovec, K., recovery of Se rectifiers after voltage pulse in blocking direction, 813
—— C. A. Accardo and E. Jamgochian, 'injected' light emission from SiC crystals, 154
Leifer, M., with others, analysis of dot-sequential colour television, 827
Leithammel, P., with others, integrating amplifier for c.r.o. recording of magnetic flux, 2276
Lemeunier, P., effect of atmospheric variations on television picture quality, 3584
Le Montagner, S., and J. Le Bot, abac for dielectric constant at cm λ, 1367
Lempicki, A., conductivity of p-type semiconductors, 160
Lenouvel, F., measurement of fluctuations in photomultiplier, 3593
Lensner, H. W., protective relay systems using microwave channels, 3235
Lentze, F., with others, single-beam c.r.o. for simultaneous display of several phenomena, 1044
Lenz, F., electron-velocity analysis with magnetic electron lenses, 1700
Le Page, L. S., survey of requirements for port radar, 3431
LePage, W. R., with R. F. Harrington, field pattern of circular array with concentric cylindrical reflector, 1212
Lepechinsky, D., temperature variations and formation of ionospheric layers, 401
Lephakis, A. J., e.s.-tube pulse-storage system, 876
Leroux, É., with others, observation of solar eclipse, 1st Sept. 1951, 1282
Leroy, R., symmetrical 'non-canonical' lattice networks, 3373
Leslie, J. A., with J. Moir, stereophonic reproduction, 2970
Lett, F. T., 12-years' progress in design of broadcasting receivers, 2877
Leverton, W. F., and W. G. Shepherd, radioactive isotopes in study of cathode evaporation, 3601
Levin, M. L., slot aerial, with directing elements, 2717, derivation of fundamental equation for, 2718, in circular waveguide, 2720
Levine, H., and J. Schwinger, diffraction of e.m. wave by aperture in infinite plane conducting screen, 1583
Levy, I. E., with others, loss of emission in oxide-cathode valves due to shock, 2863
Levy, L., and D. W. West, phosphors for c.r. tubes, 686
Levy, M., problems in analysis of curves, 2750; redundant information in transform methods, 3376
Levy, M. M., design of equalized filters and delay lines, 3029
Levy, S., and R. Truell, effect of magnetization on ultrasonic attenuation in Ni and Fe-Si single crystals, 169
Lewin, L., mutual impedance of wire aerials, 588; Advanced Theory of Waveguides, (B)600; impedance of strips in rectangular waveguides, (A)2434, 2707; multiple reflections in long feeders, 2719
—— with others, 1-MeV linear electron accelerator, 1068
Lewis, E. A., and J. P. Casey, Jr, reflection and transmission by resistive gratings, 3057
Lewis, F. D., u.h.f. harmonic generation using Ge diodes, 636
Lewis, I. A. D., variations of phase velocity in h.f. delay lines, (D)2432
Lewis, R. P. W., and D. H. McIntosh, atmospheric pressure and geomagnetic disturbance, 3428
Lex, R. G., compensation of zero-drift errors in direct-coupled feedback systems, (D)1252
Ley, B. J., and P. Greenstein, electro-optical shutters for ballistics photography, 3529
Leyton, E. McP., with E. A. Nind, vision transmitter for Sutton Coldfield station, 834
Lhermitte, R., abnormal displacement of rain echoes, 1612
Lhombreaud, C., reception of broadcasting from all over the world, 3228
Li, Yin-Yuan, application of Bethe-Weiss method to theory of antiferromagnetism, 1579
Libois, L. J., delta modulation, 2330; background noise and distortion in p.c.m., 2331; p.m. for carrier-current telephony channels, 2605
—— with R. Sueur, radio beam links in telephone networks, 2611
Lichtman, S. W., with others, rocket measurements of solar X rays and extreme-ultraviolet light, 976
Liebermann, L., effect of temperature inhomogeneities in ocean on sound propagation, 294
Lieblein, J., statistics of closest pair of triad of observations, 2545
Liebmann, G., magnetic electron-microscope, objective with minimum spherical aberration for, 1703, projector lenses for, 2569, objective lens of lowest chromatic aberration for, 2570; solution of waveguide and cavity-resonator problems with resistance-network analogue, 2839
—— and E. M. Grad, image-forming properties of magnetic electron lenses, 1701
—— with D. G. Drummond, St. Andrews conference on technique of electron microscopy, 1702, 2305
Liersch, H., with E. A. Pavel, control and measurement equipment for the broadcasting-network repeater stations of the German Post Office, 1726
Ligda, M. G. H., lightning detection by radar, 1614
Lihl, F., ferromagnetic properties of semioxidized Fe and Fe-Co powders, 1985
Limann, O., multivibrator as test apparatus, 1868
Lin, Wei-Guan, microwave filters using multimode cavity resonators, 695
Lince, A. H., aerials for TD-2 relay system, 2122
Linder, A., Statistische Methoden für Naturwissenschafter, Mediziner und Ingenieure, (B)1654
Linder, E. G., J. H. Coleman and E. G. Apgar, h.v. cold-cathode rectifier, 2927
Lindquist, R., 16-kW panoramic ionospheric recorder, 719; polar blackouts recorded at Kiruna observatory, 783
Lindsay, R. B., with others, absorption of sound in fluids, 1504
Lindström, G., with H. Atterling, cyclotron with 225-cm pole diameter, Stockholm, 2567
van de Lindt, W. J., application of multihole coupling to design of calibrated waveguide attenuator and variable impedance, 2150
Lingel, F. J., Ge diodes for indicating instruments and relays, 3283
Linton, R. L., Jr, folded fan as wide-band aerial, 590
Linvill, J. G., approximation method for network functions with prescribed magnitude and phase characteristics, 2461
Linz, A., Jr, circular-sweep chronograph for single ms intervals, 3183
Lippert, G. D., and others, investigation of interference from h.v. lines, 257
Litting, C. N. W., and W. K. Taylor, automatically controlled Knudsen-type vacuum gauge, 2817
Little, A. G., and R. Payne-Scott, equipment for observation of solar r.f. sources at 97 Mc/s, 1901
—— with R. Payne-Scott, solar r.f. sources at 97 Mc/s, observations of, 1902, movement of, across sun's disk, 2781
Little, C. G., diffraction theory of scintillation of stars on optical and radio wavelengths, 1283
—— with A. Maxwell, radio-astronomical investigation of winds in upper atmosphere, 3082
Little, P. F., and A. von Engel, dispersion of electron beams in gases, 3406
Lliboutry, L., magnetization of steels in weak magnetic fields, 1332
Lloyd, W. L., with others, first British multichannel television receiver, 2915
Loach, B. G., with L. B. Mullett, waveguide systems with negative phase velocities, 3342
Löb, E., λ/2 coaxial line for permittivity measurements at dm and cm λ, 3492
Lockhorst, D. A., with others, measurements of resistance variation with current for condensed Fe films at low temperatures, 2828
Lode, T., with J. D. Goodell, multistable magnetic memory devices, 1949
Loeb, J., cybernetics, 232, 2005; servomechanisms, stability of, 502, 2041, nonlinear harmonic analysis of, 1435; report on conference on automatic control, 2293
Lombardi, P., and M. Vallauri, experiments on Italian thermistors, 58
Long, M. W., high-speed K-band rotary switch, 1122
Longini, R. L., electrical forming of n Ge transistors using donor-alloy contacts, 1937
Loosjes, R., and C. G. J. Jansen, anomalous distribution of velocities of electrons emitted by pulsed oxide cathode, 2380
—— H. J. Vink and C. G. J. Jansen, thermionic emitters under pulsed operation, 3600
Lopukhin, V. M., electron theory, of plane magnetron, 1478, of cm-wave decelerator, 1479
—— with E. I. Vasil'ev, self-excitation of decelerating system (magnetron), 1480
Lorach, M., Dijon-Strasbourg radio-beam telephony link, 2612
Lord, R. C., far-infrared transmission of Si and Ge, 2231
Los, J. M., and J. A. Morrison, sensitive differential manometer, 1622
Lottermoser, W., reverberation times in baroque churches, 3321
Loubser, J. H. N., with others, magnetron harmonics at mm λ, 2478
Loughlin, B. D., improvements in band-shared colour-television systems, 826; theory of a.m. rejection in ratio detector, 2016
—— with others, N.T.S.C.-compatible colour television, 1750
[illegible], B., with A. [illegible], propagation of e.m. waves along a conducting dielectric-covered wire, 317, (D)3339
Lovell, A. C. B., with others, velocity distribution of sporadic meteors, 1899
Lovelock, R. T., noise limiters for television sound, 3585
—— with others, principles and practices in tropicalization, 176
Lovering, W. F., and L. Wiltshire, a.c. bridge for measurement of permittivity of gases, 787
Lovichi, A., and J. P. Deraud, crystalline structure and electroacoustic properties of magnetic tapes, 3334
Lowes, F. J., and S. K. Runcorn, analysis of geomagnetic secular variations, 671
Lozier, J. C., instantaneous compandors on narrow-band speech channels, 1112
Lubszynski, H. G., colour-television c.r. tube, 2354
Lucas, J., with others, clock with rate the true arithmetic mean of rates of several clocks, 3158
Lucas, R., interaction of e.m. waves within matter, 2206
Luchak, G., theory of magnetism of massive rotating bodies, 1594
Lucke, W. S., with D. K. Reynolds, corrugated end-fire microwave aerials, 922
Luckett, W. R., time-selection circuit for frame-synchronization separation, 1136; chart for multivibrator design, 1566
Lücking, H. W., mechanically astatized leaf electrometer, 3177
Ludeke, C. A., subharmonic forced oscillations, 1571
Lüdi, F., theory of magnetron amplifier, 2669
Lueder, H., charge on ice formed in supercooled mists, 677
Lueg, R., M. Päsler and W. Reichardt, impulse integral and Duhamel step integral, 1352
Lugeon, J., world radio meteorology and weather prediction, 415
Luhrs, C. H., correlation of Faraday and Kerr magneto-optical effects, 1275
Lund, N., C. F. P. Rose and L. G. Young, amplifiers for multichannel s.s.b. transmitters, 2920
Lundbak, A., aerial survey of vertical magnetic field over the Sound (Sweden), 123
Lundburg, F. J., and F. X. Bucher, cage-type v.h.f. phase-comparison omnidirectional-radio-range aerial, 3097
Lundquist, S., stability of magneto-hydrostatic fields, 122
Lunelli, L., transmission-line models for study of e.m. wave propagation 2318
Lur'e, O. B., transients in wide-band feedback amplifiers, 96
Luscombe, G. W., with others, propagation of m-λ waves beyond horizon, 242
Lusher, G. V. G., with F. A. Benson, pulse generator, cathode-coupled, 1944, 3-valve, 1554
Lutsch, A., measurement of elastic constants using ultrasonic pulses, 3189
Luttinger, J. M., effect of magnetic field on electrons in periodic potential field, 1588
Lyddiard, J. A., cathode-coupled-amplifier analysis, 1559
Lygrisse, P., microvoltmeter and u.h.f. field-strength meter, 1662
Lynch, W. A., stability problem for feedback amplifiers, 367
Lyubarski, G. Ya., with A. I. Akhiezer, nonlinear theory of oscillations in electron plasma, 3063

M

Ma, Min-Yuan, with others, stability of control systems, 2619
Maak, W., Fastperiodische Funktionen, (B)436
MacColl, L. A., reflection of electrons by metallic crystals, 961
Macdiarmid, I. F., conditions for monotonic transient response, 618; cathode-coupled amplifier, (D)2480
MacDonald, A. D., with E. W. Guptill, acoustic field near circular transducer, 2678
Macdonald, D. K. C., internal size-effect in metallic conduction, 649, 2191; information theory and its application to taxonomy, 2960
MacDonald, J. R., resonance and internal field in ferromagnetic materials, 1632
Macek, O., slotted waveguide sections for cm-wave measurements, 1372
Machin, K. E., and F. G. Smith, radio method for measuring electron density in solar corona, 1281
—— M. Ryle and D. D. Vonberg, equipment for measuring small r.f. noise powers, 2560
Mack, R. A., with others, dee-bias system for f.m. cyclotron, 762
Mackenzie, R. B., modulation characteristic of television c.r. tubes, 2353; graphical assessment of tone reproduction in television systems, 3260
Mackey, D., and E. Sass, printed components in television tuner, 1139
MacKnight, M. L., and R. L. Chasson, construction of external-cathode G-M counters, 1078
Maclusky, G. J. R., with others, millimicrosecond-pulse techniques, 2730
Macnee, A. B., limits of accuracy of analogue computers, 1947
Maddock, A. J., voltage stabilization, 1748
Madella, G. B., acoustic coupling of diaphragms of duo-cone loudspeakers, 21; synthesis of polyphase RC filters, 3087
Magnan, C., with P. Chanson, first results with a proton microscope, 2002
Magnus, W., and F. Oberhettinger, systems of linear equations in theory of guided waves, [illegible]
Mahren, A. A., complex-waveform generator, 3498
Maier, K., measurement of temperature dependence of voltage drop and of backward current in dry rectifiers, 187
Maier, L. C., Jr, and J. C. Slater, field-strength measurements, in linear-accelerator cavity, 2264, in resonant cavities, 2265
Maikoff, N., with W. Känzig, magnetism of free charge-carriers in semiconductors, 1321; transition of $BaTiO_3$ at 120°C, 1342
Maine, A. E., coil calculation for magnetic devices, 3365
Maire, J., transatlantic reception at frequencies near 30 Mc/s, 1086
Makinson, K. R., transmission of ultrasonic waves through thin plate in liquid, 2409
Makinson, R. E. B., and others, dielectric constant and electron density in gas discharge, 351
Malan, D. J., and B. F. J. Schonland, distribution of electricity in thunderclouds, 1803
—— with N. D. Clarence, magnetic-tape recording of e.s. field changes, 190
—— with B. F. J. Schonland, distribution of electricity in thunderclouds, 413
Malatesta, S., basis of information theory, 488
Mallinckrodt, C. O., instantaneous compandors, 260
—— with others, experimental verification of theory of laminated conductors, 2988
Malpica, J. M., e.s. d.c. 300-kV transformer 270
Malsch, J., transistors, 1648
Malter, L., E. O. Johnson and W. M. Webster, discharge modes for hot-cathode arcs, 859
—— with others, anode-glow of hot-cathode arcs, 3068
Malthaner, W. A., and H. E. Vaughan, experimental electronic automatic switching system, 2597
Malvano, R., and M. Panetti, detection of small variations of Q of cavity resonator, 192
Mandl, M., with E. M. Noll, Television and F.M. Antenna Guide, (B)1644
Maniwa, H., with others, antiferroelectric structure of $PbZrO_3$, 1018
Mann, P. A., p.f.m. distortion in band-pass filters, 1215
Mannerberg, E. F., with others, modified-butterfly u.h.f.-television converter, 524
Manning, L. A., with others, studying sporadic-E clouds, 3080
Mansfeld, W., oscillator circuits as frequency modulators, 283; f.m. by reactance valve, 2066
Mantz, M. R., suppression of impulse interference by gradient limiting, 2020
March, A., Quantum Mechanics of Particles and Wave Fields, (B)2276
Marchand, N., H. R. Holloway and M. Leifer, analysis of dot-sequential colour television, 827
Marchese, T. J., with others, periodic-waveguide travelling-wave amplifier for medium powers, 1153
Marcotte, P. G., with others, reciprocity calibration of piezoelectric accelerometers, 3516
Marcuvitz, N., field representations in spherically stratified regions, 663; Waveguide Handbook, (B)3358
—— with others, approximation methods in radial-transmission-line theory, 39
Marique, J., response of circuit, to linear-frequency-sweep voltage, 942, to sawtooth-frequency-sweep voltage, 2041; C.C.R.M. remote monitoring of naval and air service transmissions, 1088; mode of operation of simple quartz filter, 3035
Markham, J. J., second-order acoustic-field relations between density and pressure, 2963, energy relations, 2964
—— R. T. Beyer and R. B. Lindsay, absorption of sound in fluids, 1504
Marko, H., 'transrector', quadripole equivalent of rectifier, 1120; theory and practice of ratio detector, 2394
Markusen, D. L., flight-path control, 1003
Marmor, S., superregenerative receivers for pulse reception, 481
Marro, A., narrow-band electromechanical filter, 3084
Marshall, J. F., with M. A. Pomerantz, fundamentals of secondary-electron emission, 856
Marshall, W. F., microwave generator with crystal control, 1066
Marsham, T. N., with B. Collinge, a.c. stabilizer, 2046
Martin, A. V. J., Paris Television Show, 1133; Type TVL25 valve voltmeter, 1503
Martin, S., and H. A. Woods, l.f. noise spectra of hot-filament low-pressure discharges, 2942

Martin, J., with others, secondary emission from composite surfaces, 2196
Martin, J. K., with R. C. Woods, testing of fine wires for telecommunication apparatus, 717
Martin, R. A., and R. D. Teasdale, input-admittance characteristics of tuned coupled circuits, 1241, (C)2157
Martinet, J., semiconducting properties of oxides of Fe, 3138
Marton, L., electron-beam interferometer, 2562; Advances in Electronics Vol. 3, (B)2674
Marvaud, J., automatic tracer for electron trajectories, 2283
Marzin, P., radio links, general technical considerations, 2028
Mason, W. P., and H. J. McSkimin, ultrasonic investigation of mechanical properties of polymers, 1317
—— and S. D. White, measuring forces and wear in telephone switching apparatus, 2561
—— with others, frequency and magnetic-field dependence of elastic constants of and losses in Ni, 887
Massey, H. S. W., with D. R. Bates, negative-ion concentration in lower ionosphere, 983, 2796
Masucci, C., with W. B. Whalley, analysis of crystal-diode operation in mV region, 3296
—— with others, stabilization of vertical-deflection amplifiers, 1761
Mataré, H. F., Empfangsprobleme im Ultrahochfrequenzgebiet, unter besonderer Berücksichtigung des Halbleiters, (B)2591; barrier-layer interaction and statistical fluctuations in transistors, 2928
Mather, G. R., ionospheric cross-modulation, 474
Mather, N. W., analysis of triple-tuned coupled circuits, (C)1240
Matheson, L. A., and V. J. Caldecourt, charge storage in polystyrene-film capacitors, 932
Mathews, W. E., travelling-wave amplification by means of coupled transmission lines, 867, (C)1469
Mathis, H. F., proof that isotropic aerial is impossible, 37
Matricon, M., demountable reflex klystron for mm λ, 2394
Matsudaira, M., M. Wada and T. Koda, considerations on space-charge equation, 3591
Matsui, E., with T. Nimura, upper frequency limit of cone-type loudspeakers, 3328
Mauderli, W., with G. Joyet, medical applications of 31-MeV betatron, and shielding problems, 1996
Maunu, J. T., spacing and dielectric constant of pairs in multipair cables, 27
Maurice, D., G. F. Newell and J. G. Spencer, proposed test procedure for f.m. receivers, 1984
Mawardi, O. K., generalization of concept of impedance in acoustics, 298
Mawson, D. L., with D. Hadfield, permanent magnets for spectrographs and nuclear physical research, 3480
Maxwell, A., identification of solar M region with coronal region of intense radio emission, 2213
—— and C. G. Little, radio-astronomical investigation of winds in upper atmosphere, 3082
Mayer, H., production of very short pulses, 2476
Mayer, H. F., and E. Hölzler, developments in transmission of information, [illegible]
Mayer, R. W., with H. Chestnut, Servomechanisms and Regulating System Design, (B)816; stability and accuracy of servomechanisms, 2038
Mayo, C. G., beat-frequency sources, distortion in, 1552, theory of mixing for, 2475; standing-wave patterns in studio acoustics, 2975
—— and D. G. Beadle, portable tone source for acoustic measurements, 1382; direct measurement of reverberation time, 1817
—— D. G. Beadle and W. Wharton, equipment for acoustic measurements, 1681
Mayot, M., with others, electron distribution in ionosphere and s.w. absorption, 1300
McAdam, W., R. E. Tarpley and A. J. Williams, Jr, d.c. amplifier with reduced zero-offset, 93
McAfee, K. B., W. Shockley and M. Sparks, measurement of diffusion in Ge by capacitance method, 2821
—— and others, Zener current in Ge *p-n* junctions, 164
McAuslan, J., and K. J. Brimley, dekatron timer, 3485
McCaffrey, B. I., siting microwave relay aerials by helicopters, 498
McCaig, M., with K. Hoselitz, torque curves and magnetic properties of alcomax, 426, and of other permanent-magnet alloys, 2536
McCombie, C. W., with R. V. Jones, Brownian fluctuations in galvanometers and galvanometer amplifiers, 2280
McCoy, R., with F. R. Bradley, driftless d.c. amplifier, 1877
McCready, L. L., with others, ionospheric thermal radiation at r.f., 406
McCulloch, J., Type-N power-line carrier equipment, 2094
McDonald, D., nonlinear techniques for improving servo performance, 1117
McEachron, K. B., lightning protection since Franklin's day, 3244
McFall, R. W., with S. M. Kaplan, application of noise statistics to radar-range performance, (D)2221
McFarlane, A. B., and J. R. W. Smith, mathematical analysis of equivalent scanning circuit, 1441
McGee, J. D., television technique as aid to observation, 3252
—— and E. L. C. White, television camera tubes, (D)522
McGhee, H., with R. Theile, negative feedback in flying-spot scanners, 3255
McGinnis, C. S., and V. F. Albert, multiple Helmholtz resonators, 3311
McGrath, J. W., Beranek's theory of acoustic impedance of porous materials, 2695
McIlwain, K., requisite bandwidth for colour television, 3247
McIntosh, D. H., geomagnetic solar-flare effects at Lerwick and Eskdalemuir, 339
—— with R. P. W. Lewis, atmospheric pressure and geomagnetic disturbance, 3428
McKay, K. G., electron and hole production in Ge by α particles, 1636; *n-p-n* junction as model for secondary photoconductivity, 1638
McKeehan, L. W., with J. S. Kouvelites, magnetostrictive vibration of Ni-Fe and Ni-Cu spheroids, 3458
—— with others, magnetostrictive vibration of prolate spheroids, 1929
McKinley, D. W. R., variation of meteor-trail-echo rates with radar-system parameters, 995
—— and B. E. Bourne, accurate radio time-signal system, 1363
McKinney, C. M., Jr, radiation patterns of dielectric-rod aerials, 2121
—— with C. W. Horton, radiation patterns and gain of dielectric-rod aerials, 1204; measurement of λ and attenuation in dielectric waveguides, 1965
McKinney, R. S., precision a.m. frequency monitor, 1111
McLaughlin, K. M., with N. S. Freedman, phosphor-screen production for colour kinescopes, 849
McLucas, J. L., narrow-band relay system for radar display, 3430
—— and R. C. Raymond, power spectrum of narrow-band noise after passage through a nonlinear impedance, 1095
McMillan, B., introduction to formal theory of network realizability, 2138, 2455
McSkimin, H. J., and others, elastic constants of Si single crystals, 1014
—— with W. P. Mason, ultrasonic investigation of mechanical properties of polymers, 1317
—— with others, frequency and magnetic-field dependence of elastic constants of and losses in Ni, 887
Medhurst, R. G., dipole aerials in close proximity, 589
—— and J. A. Knudsen, power meter and mismatch indicator, (D)1680
Medlock, R. S., and W. A. Kealy, self-balancing instruments in nucleonics applications, 1087
Medovoi, A. I., with N. V. Kozhevnikova, ferroelectric properties of tantalates and niobates of alkali metals, 3111
Meek, J. H., reflection of radio waves via triangular path ,2314; ionospheric disturbances over Canada, 2805
Mehrbach, E., with W. H. Sayer, Jr, u.h.f. television transmitter using coaxial-line cavities, 1448
Mehrotra, R. R., with others, scattering of radio waves in ionosphere, 779
Meinke, H. H., Felder und Wellen in Hohlleitern, (B)52; branch connections of lines and waveguides, 909; diaphragms in waveguides, 1197; h.f. wide-band impedance transformers, 3027
—— and A. Scheuber, junction units for coaxial cables, 2429, 2985
Meister, F. J., audiometer measurement of hearing loss, 2101
Meixner, J., general theory of sound absorption in gases and liquids, 3315
—— and W. Kloepfer, theory of annular-slot aerials, 323
Melcher, D., experimental investigation of icing phenomena, 1589
Melchior, G., with others, C.S.F. television transmitters, 3576
Melman, I. J., E. S. White and S. Cuker, C.B.S.-Columbia combined colour and black-and-white television receiver, 1758
Melville, W. S., saturable reactors as discharge devices for pulse generators, (D)2450
Menard, J. Z., recording medium for transcribed messages, 2428
Menzies, A. C., radiation-measurement instruments for infrared to ultraviolet waveband, 1991
Merrill, F. G., with others, magnetic modulators, 1528
Merriman, J. H. H., R. Hamer and B. R. Horsfield, subscriber's single channel v.h.f. R/T equipment, 492
Mesnard, G., and R. Uzan, electrical properties of thorium, 869
Messerschmidt, W., distance measurement by radar, 2810; measurement of angles by d.f. technique, 3092
Metson, G. H., oxide-cathode activation in high-vacuum valves, 3278
—— and others, life of oxide cathodes in receiving valves, 1781
Metzger, S., N. H. Gottfried and R. W. Hughes, microwave radio links of Bonneville Power Administration, 3236
Meunier, P., new pentode for wide-band amplifiers, 3288
Meyer, E., 'Stromdämmung', German term for 'ohms per volt', 1375; determination of characteristics of permanent-magnet materials, 3461
—— and W. Kuhl, geometrical room acoustics, 2974
—— and others, measurement of indirect sound transmission in buildings, 11
Meyer-Eppler, W., measurement of frequency characteristics of linear systems, 210; investigation of transducers by repeated and retrograde re-recording, 1509; electronic sound sources in broadcasting, 3324
Meyer-Hartwig, E., and H. Federspiel, manufacture, regulating action and applications of thermistors, 688
Meyerhoff, A. A., interaction between surface-wave transmission lines, 3340
Meyers, A. L., plastic-insulated land communication cables, 1826
Michard, R., with others, observations of solar eclipse, 25th Feb. 1952, 2785
Micheletta, C., with A. Ascione, propagation experiments at 33 Mc/s, 787
Michels, A., and J. P. Pérez, frequency shift of quartz under high pressure, 1350
Michelssen, F., German radar technique, 1306
Middleton, D., energy distribution, in randomly modulated waves, 802, in noise- and signal-modulated waves, 2333, 2891; theory of random noise, 1096
—— with others, statistical errors in measurements of random time functions, 2843
Mihran, T. G., duplex travelling-wave klystron, 2091
Mikhailov, G. P., effect of orientation on dielectric losses in polar polymers, 3113
Miles, J. W., transmission cross-section of aperture for oblique-incidence acoustic diffraction, 2686; diffraction by wedge, of acoustic pulse, 2966, of e.m. pulse, 3056
Millar, W., theorems for nonlinear systems with resistance, 1226
Miller, C. F., and F. G. Whelan, measurement of dissipation factor and dielectric constant, 2268
Miller, J. H., frequency compensation of a.c. instruments, 202
Miller, K. S., one-sided Green's function, 711
—— with L. A. Zadeh, generalized ideal filters, 2147; fundamental aspects of linear multiplexing, 3552
Miller, S. E., transmission of TE_{01} waves round bends in circular waveguide, 3345
—— and W. W. Mumford, multi-element directional couplers, 3380
Miller, T., transient response of narrow-band a.f.c. system, 608
—— and D. Sims, high-resolution spectrum analyser, 1050
Millership, R., R. C. Robbins and A. E. De Barr, magnetostriction storage system for digital computer, 1200
Millington, G., effect of geomagnetic field on s.w. communication via the ionosphere, 778
Millman, J., and S. Seely, Electronics, (B)1080
Millman, S., spatial-harmonic travelling-wave amplifier for 6-mm λ, 547
Mills, B. Y., and A. B. Thomas, source of r.f. radiation in Cygnus, 120
Milner, C. J., and B. N. Watts, properties and applications of PbS photocells, [illegible]
Min-Yuan Ma. See Ma, Min-Yuan.
Mindlin, R. D., forced vibrations of piezoelectric crystal plates, 2156
Minnaert, M., with others, absence of H 1420-Mc/s line from solar r.f. radiation, 977
Minnett, H. C., with J. H. Piddington, solar r.f. emission from high-temperature regions, 116; r.f. radiation, from galaxy, 1·21 and 3 kMc/s, 1906, from Cygnus, 2788
Minnis, C. M., graphical representation of longitude effect in F_2 region, 3081
—— with A. F. Wilkins, comparison of ionospheric radio transmission forecasts with practical results, (D)2574
Minorsky, N., a.c.-maintained pendulum, 1257; oscillations in systems with delayed action, 3040
Mirimanov, R. G., dipole near ellipsoid of revolution of good conductivity, 2997; e.m. field inside spherical envelope with nonuniform permittivity, 3415
Misener, A. D., and L. G. D. Thompson, pressure coefficient of resistance of thermistors, 3018
Mitchell, E. W. J., impurity scattering in oxide semiconductors, 2524
—— with J. H. Burrow, two modifications to ionization gauge, 2229
Mitchell, R. M., damping factor of a.f. amplifiers, 365
Mitra, A. P., ionosphere D layer, 132; tides in ionosphere, 2510, over Calcutta, 400
Mitra, S. C., with others, volume rectification in zincite, 158
Mitrovic, D., new construction principle for analogue computers, 3484
—— R. Huron and R. Tomovic, new construction principle for analogue computers, 2256
Mittelman, E., measurement of dielectric properties during h.f. heating, (A)1032
Moeller, F., electrical measurements, sensitivity of apparatus for, 198, amplification of amplifiers for, 723
Moffet, W. T., with R. G. Bickford, photostimulator, 225
Mohrmann, J., tracking problem in superheterodyne receiver, 2323
Moir, J., review of British amplifiers, 1245
—— and J. A. Leslie, stereophonic reproduction, 2970
Moisson, A., blind-landing system, Type AB, 146
Mokhtar, M., and H. Youssef, mechanism of edge tones, 3303
Mol, H. compressive stress of ear, 1500
Moles, A., artificial reverberation in theatres, 566; elements of space information in microphone systems, 1815; concept of high fidelity of response of electroacoustic systems, 2105
—— and G. Corsain, detector of transients in music and speech signals, 2417
Moline, J., precision in e.m. measurement of distance, 1611; radar buoys and their circuits, 1922; instructional radar equipment, 2220
Moll, J. L., with R. W. Wilmarth, 8–15-kMc/s oscillator, 2948
Möllenstedt, G., and O. Rang, e.s. lens as velocity filter, 461
Möller, H. G., quadripoles and matrices, 936
Molloy, C. T., with C. M. Harris, theory of sound absorptive materials, 1818
Molnar, J. P., Townsend discharges, form of transient currents in, 958, pulsed, electron-emission processes in, 960
Möltgen, G., dielectric investigations on ferrites, 3459
Monfort, R. A., with others, N.B.C. New York colour-television field-test studio, [illegible]
Monk, N., experimental R/T service for trains, 961
Monnot, R., factors affecting quality of television pictures, 3583
Montalenti, G., with G. Bonfiglioli, stabilized mains-supplied valve electrometer circuit, 1669
Monteath, G. D., application of compensation theorem to radiation and propagation problems, 591; Wrotham v.h.f. broadcasting aerial, 91[illegible]
Montessori, G., electronic pulse systems for telegraphy, 3232
Montgomery, G. F., with others, u.h.f. moon relay, 2906; new kind of v.h.f. radio propagation over long distances, 2581
Montroll, E. W., and J. M. Greenberg, scattering of plane waves by soft spheres and cylinders, 3397
—— and R. W. Hart, scattering of plane waves by soft obstacles, cylinders, spheroids and disks, 1261
Moodey, H. C., and D. D. Van Ormer, 3-beam guns for colour kinescopes, 850
Moody, N. F., G. J. R. Maclusky and M. O. Deighton, millimicrosecond-pulse techniques, 2730
—— and others, counting system for nucleonics, 610
Moon, J. H., calibration of aircraft direction-finders, and test-site selection, 143, (C)997
Moon, P., and D. E. Spencer, separability conditions for Laplace and Helmholtz equations, 3482
Moore, A. F., with others, variation with depth of geomagnetic field, 1596
Moore, A. R., with others, growth and manipulation of BaO crystals, 174
Moore, D. G., with others, development and operation of a line-screen colour kinescope, 848
Moore, J. R., combination open-cycle closed-cycle control system, 810
Moore, W. C., simultaneous a.m. and f.m. in rocket telemetry, 1691
Moral, J. J. R., mathematical solution of potential-distribution problems, [illegible]
Morand, M., A. Raskin and L. Winand, e.s. generator giving over 1 MV and using glass-dust stream, 3517
Morgan, D. O., horn aerials for television, 329
Morgan, G. D., with F. L. Jones, h.f. discharges, breakdown mechanism and similarity relation, 378, similarity relation for minimum maintenance potentials, 379
Morgan, J. M., with others, portable television pickup equipment, 2911
Morgan, S. P., Jr, with others, experimental verification of theory of laminated conductors, 2988
Morin, F. J., electrical properties of $\alpha\text{-}Fe_2O_3$ and of $\alpha\text{-}Fe_2O_3$ containing Ti, 1009
Morita, K., direction finder and energy-flux meter for cm waves, 998
Morita, T., and C. E. Faflick, current distributions along coupled aerials and folded dipoles, 917
—— with J. V. N. Granger, r.f. current distributions on aircraft structures, 47
—— with others, measurement of aerial impedance using receiving aerial, 585
Morris, A. L., tape-wound magnetic cores, 3471
Morrison, J. A., with J. M. Los, sensitive differential manometer, 1622
Mortenson, E. M., and C. B. Young, short-distance p.a.m. radio link, 2029
Mortimer, D. E., with C. Clarke, automatic atmospherics-waveform recorder, 679
Mortley, W. S., frequently-modulated quartz, 537
Morton, C., voltage stabilizer with self-regulated heater supply, 1747
Morton, J. A., transistor developments, 2651, 3269
Mosaner, H., and M. Wurl, growing piezoelectric crystals, 1346
Moses, H. E., and Ta-You Wu, O_2 dissociation in upper atmosphere, 129
Moskowitz, S., and J. Racker, Pulse Techniques, (B)1567
—— L. Diven and L. Feit, crosstalk in time-division-multiplex systems, 1104
Moss, H., criteria for maximum pulse sharpness in RC-coupled networks, 631
Moss, S. H., pulse distortion, (A)55, 619
Moss, T. S., optical properties of Te in infrared, 2230; properties of films of nonmetallic Sb, 2522
—— with others, long-wave limit of PbSe photocells, 1771
Mostafa, A. E. S., valve performance for large signal voltages, (C)865
Mostovetch, N., conduction mechanism in thin metal films, 376
—— and T. Duhautois, temperature and voltage variation of resistance of thin evaporated metallic films, 1634
—— B. Vodar and T. Duhautois, variation of resistance of metal films with applied potential, 2192
Motz, H., radiation from fast electron beams, (C)966
Motzo, M., with others, experimental determination of gyro-interaction resonance curve, 2010
Moullin, E. B., nonlinear resistor in series with impedance, (D)1529
—— and F. M. Phillips, current induced in conducting ribbon by incident plane e.m. wave, (A)2441, 2723
Moulton, C. H., signal distortion by directive broadcasting aerials, 2600
Mourmant P., curves of equal h.f. power of transmitter, 2362; probabilities relating to a continuous electron beam, 3407
Moussa, A., and J. Lafoucrière, vector potential of rotationally symmetrical magnetic field, 111
Moussiegt, J., cm-wave lattice lenses, 3004, experimental results for, 3355
Moutte, L., with P. Chavance, impedance matching of travelling-wave valve Type M8 to waveguide, 2940
Moxon, L. A., high-efficiency grid modulation, 1464
Moyano Reina, F., matching of balanced transmitters to unbalanced transmission lines, 1837
Muckenhirn, O. W., 'recording demagnetization' in magnetic tape recording, 23
Muehlner, J. W., transfer properties of circuits with and without feedback, 70
Mueller, G. E., broadside dielectric aerial, 1205
Mueser, R. E., with others, design of optimum directive acoustic arrays, [illegible]
Mulders, C. E., ultrasonic measurements on liquids, 563
Mulholland, E. B., multichannel distance-measuring equipment for aircraft, 2813
Muller, C. A., and J. H. Oort, interstellar H 1420-Mc/s line and galactic rotation, 982
—— with others, absence of H 1420-Mc/s line from solar r.f. radiation, 977
Müller, E. W., field-emission ion microscope, 2866
Müller, F., hearing aids, measurements on, 903, testing of, 904, testing of components of, 1193
Müller, H., new modulation meter, 200
Müller, J., determination of amplitude and phase characteristics of linear networks with square waves, 209; transmission of step function by negative-feedback amplifier, 1879
—— with R. Hoffmann, carrier-frequency transmission on television cables, 2903
Muller, M. W., with R. L. Jepsen, enhanced emission from magnetron cathodes, 1176
Müller, R., effect of deformation of cylindrical cavity resonator, 1243
Müller-Lübeck, K., two-way space-charge flow with plane electrodes, 1775
Mullett, L. B., and B. G. Loach, waveguide systems with negative phase velocities, 3342
Mumford, W. W., with S. E. Miller, multi-element directional couplers, 3380
Munn, A. J., with others, multichannel s.s.b. radio transmitter, 2922
Murakami, T., grounded-grid u.h.f. amplifiers, 2639
Muscia, C., study of electron lens by W.K.B. method, 3203
Muscio, W. T., selective calling applied to mobile radio, 1737
Mushiake, Y., with S. Uda, calculation of input impedances of two parallel aerials, 326; theory of aerials with thickness discontinuities, 1203; input impedance of slot aerials, 1839
Mutter, W. E., improved c.r. tube for Williams memory system, 2945

N

Nagai, K., design theory for pulse amplifiers, 363
—— and others, transmission efficiency of long feeder lines for v.h.f., 2116
—— with R. Sato, design of directive aerial with single reflector, 3352
Nagamiya, T., theory of properties of $NH_4H_2PO_4$, 3398
Nagata, T., solar-flare effect on geomagnetic field, 2500
Naismith, R., and E. N. Bramley, time-delay measurements at medium frequencies, 473, (D)1714
Narita, S. I., thermionic emission and electrical conductivity of oxide-coated cathodes, 3277
Nedelka, J., with others, multichannel s.s.b. radio transmitter, 2922
Néel, L., theory of magnetic diffusion after-effect, 3072
—— and R. Pauthenet, thermomagnetic study of single-crystal $\alpha\text{-}Fe_2O_3$, 3125
Nesteson, P. A., 'flywheel' synchronization of sawtooth generators in television receivers, 3262
Nelson, H. M., temperature distribution with simultaneous platten and dielectric heating, 2564
Nelson, J. H., planetary position effect on s.w. signal quality, 3212
Nelson, R. B., magnetrons for dielectric heating, 556, 3292
Nelson, V. R., gated-amplifier wave analyser, 3170
Neppiras, E. A., and B. E. Noltingk, onset of cavitation produced by ultrasonic generator, 1804
Nertney, R. J., fine structure of lower ionosphere, (D)131
—— with J. J. Gibbons, wave solutions for ionospherically reflected long waves, 137
Nesbitt, E. A., and R. D. Heidenreich, magnetic structure of alnico-5, 2531, 3456
—— with R. D. Heidenreich, magnetic structure of alnico-5, 2530
Nethercot, A. H., Jr, with others, magnetron harmonics at mm λ, 2478
Neumann, J., h.f. admittance meter, 2558
Nevitt, H. J. B., with others, v.h.f. multichannel carrier-telephony circuits in Colombia, 1430
Newell, G. F., with others, proposed test procedure for f.m. receivers, 1984
Newhall, E., P. Gomard and A. Amlay, saturable reactors as r.f. tuning elements, 3394
Neyer, H., and K. Rawer, variation of angle of arrival with sunspot cycle, 475
Neyret, G., with J. Debiesse, study of valves by use of radioactive elements, 1782
N'Guyen, Thien-Chi, and J. Suchet, thermistors, refractory, 185, temperature compensation of precision measurement apparatus by, 199, temperature regulation by, 2291; nonlinear resistors, with sintered-carborundum base, 1219, with sintered-semiconductor base, 3364; conductivity of semiconductors and thermistors, 1845

Nicholls, F. W., with A. M. Spooner, linear 'staircase' generator for television use, 1684
Nicholson, G. F., rationalized M.K.S. system, 659
Nicolet, M., solar noise, 117
Nicoll, F. H., with others, development and operation of a line-screen colour kinescope, 348
Niedetzky, G., Wheatstone bridge with load-dependent resistors, 446; applications of, 1975
Niehrs, H., analysis for half-wave rectifier with capacitive smoothing, 1745
Nielsen, A. K., simplified reciprocity calibration of capacitor microphones, 3312
Nielsen, B., propagation conditions for v.h.f. range, 1736
Nifontoff, N., conductivity of thin C films, 2827
—— with others, thin C films, conductivity of, 171, flicker effect in, 341
Nimura, T., diffraction of sound by circular apertures, 304; resonance frequency of spheroidal cavity resonator, 357
—— and E. Matsui, upper frequency limit of cone-type loudspeakers, 3328
—— and K. Shibayama, radiation impedance of ribbon-type sound sources, 3301; diaphragm resonance in cone-type loudspeakers, 3326, 3327
—— and Y. Watanabe, effect of finite circular baffle on acoustic radiation, 1180
Nind, E. A., and E. McP. Leyton, vision transmitter for Sutton Coldfield station, 834
Nisbet, J. S., parallel-T network as linear mixer, 1537
Nitsche, E., with others, reversible changes in Se rectifiers, 1642
Nitsche, H., with others, high power f.m. broadcasting transmitters, (C)534
Nodtvedt, H., correlation function in analysis of directive propagation, 882
Nolan, J. J., electrical conductivity of lower atmosphere, 411
Noll, E. M., and M. Mandl, Television and F.M. Antenna Guide, (B)1844
Nolle, A. W., with R. Barthel, recording ultrasonic interferometer and applications, 1807
Noltingk, B. E., with E. A. Neppiras, onset of cavitation produced by ultrasonic generator, 1804
Nomura, Y., diffraction of e.m. waves by perfectly reflecting wedge, 374; propagation of e.m. waves, from dipole over earth's surface, 467, behind a mountain, 3531
—— and Y. Aida, radiation impedance of rectangular plate with infinite baffle, 301
Nonnekens, J. C., 625-line television equipment at Brussels show. Sept. 1950, 518
Nonnenmacher, W., construction of band-pass filters from basic elements, 2748
Noriega, L. R., reflections at dielectric in waveguide, 32
Norinder, H., experimental lightning research, 3088
—— and O. Salka, impulse resistance of earth electrodes and embedding materials, 428; mechanism of long-gap positive spark discharges in air, 3403
—— and R. Siksna, variations of ion concentration near ground, 410, 1608
Norrby, H., with K. Behr, portable field radio equipment SUF-21K, 2898
Northover, F. H., anomalous propagation in 1–10-m band, 1409, (C)2012
Northwood, T. D., with others, reflection of pulse by spherical surface, 2682
Norton, K. A., and P. L. Rice, gapless coverage in air-to-ground communications at frequencies > 50 Mc/s, 2334
—— E. L. Shultz and H. Yarbrough, probability distribution of phase of resultant of constant vector and one with Rayleigh distribution, 2251
—— with others, service range for aircraft communication at frequencies > 50 Mc/s, 2616
Nottebrock, H., Bauelemente der Nachrichtentechnik, Teil 2, Widerstände, (B)954, Teil 3, Spulen, (B)1254
Novgorodsky, G., with A. Herrent, application of Bode's relation to calculation of Nyquist diagram, 56
Novosil'tsev, N. S., investigation of dielectrics by c.r.o., 441
—— with others, dielectric properties of TiO_2, 1345
Nowak, A., two-circuit band-pass filter and modulation conversion, 2321
Noyer, R. O., with others, test-pattern generator for colour television, 519
Nutting, J., with E. D. Hyam, electron- and optical-microscope examination of identical areas, 3523
Nyborg, W. L., M. D. Burkhard and H. K. Schilling, acoustic characteristics of jet-edge systems, 2681

O

Oatley, C. W., with others, factors affecting the design of automatic electron-trajectory tracer, 2852
Oberdorfer, G., Die Ortskurventheorie der Wechselstromtechnik, (B)371
Oberhettinger, F., with W. Magnus, systems of linear equations in theory of guided waves, 1582
Oberst, H., with others, measurement of indirect sound transmission in buildings, 11
Obukhov, A. P., with others, electrical properties of thin layers containing grey tin, 2829
O'Callaghan, T., effect of alteration of network parameters on resonance frequency, 66; synthesis of shunt-reactance networks with given resonance and antiresonance frequencies, 3368
Odartchenko, S., with H. Campet, 150-kW medium-wave broadcasting transmitter, 3588
O'Donnell, G. A., atmospheric conductivity at 1 m and at ground level, 2806
O'Dwyer, J. J., field dependence of dielectric constant, 1932
Œhmichen, J. P., delay network for flash-bulb release, 1232
Oertel, H., distortion of N-shaped signals in RC amplifiers, 2484
Oesterlin, W., complex feedback, 2173
Oetker, R., c.r. tube as indicator for a.c. bridges, 207
Officer, C. B., Jr, normal-mode propagation in 3-layered liquid half-space by ray theory, 1490
O'Gorman, V., with others, computation of dielectric constants, 3166
Ohl, R. S., properties of ion-bombarded Si, 1337
—— with E. F. Kingsbury, photoelectric properties of ion-bombarded Si, 2929
Okamura, T., T. Fujimura and M. Date, permittivity and permeability of ferrites at 6·6-cm λ, 2535
—— Y. Torizuka and Y. Kojima, ferromagnetic resonance in Co ferrite at high temperature, 1327
Okumura, K., with others, p-n transition in (BaSr)O cathode, 1472
Oldenbourg, R. C., and H. Sartorius, Dynamik selbsttätiger Regelungen, Vol. 1, (B)511
Oliner, A. A., with others, approximation methods in radial-transmission-line theory, 29
Oliver, B. M., efficient coding, 2888
Olson, A. L., with others, colour television system for industry, (A)278
Olson, H. F., enclosures for direct-radiator loudspeakers, 1510
Omori, T., with others, transmission efficiency of long feeder lines for v.h.f., 2116
Ono, M., deviation from Ohm's law at anode surface of Cu_2O rectifiers, 2043
Oort, J. H., with C. A. Muller, interstellar H 1420-Mc/s line and galactic rotation, 982
van Oosterhout, G. W., with others, ferroxdure, 2824
Orchard, H. J., synthesis of RC networks with prescribed transfer functions, (D)2458
Ordung, P. F., and H. L. Krauss, response speed of cathode-coupled clipper circuit, 941
—— with J. T. Fleck, realization of transfer ratio with RC ladder network, 348
Orman, L. M., and L. G. Callahan, $BaTiO_3$ delay lines, 1231
O[illegible], B. L., and E. Y. Garrido, semiconductors, 159
Osborne, B. W., observations of F_2 region at Singapore, 989; ionospheric conditions affecting broadcasting in tropics after sunset, 2539; lunar variations of f_0F_2 at Singapore, 2869
Osmond, W. P., magnetic properties, of α-Fe_2O_3, 1829, of iron-oxide powders, 2528
Oswald, J., total or partial suppression of a modulation sideband, 2380
Ott, H., surface waves, (D)468; ground wave of transmitter, 777; cut-off frequency for e.m. wave in dielectric plate, 1895
Otte, J., with others, Electronic Valves, Book V—Application of the Electronic Valve in Radio Receivers and Amplifiers, Vol. 2—A.F. Amplification, the Output Stage, Power Supply, (B)2765
Otto, R., f.m. by capacitor with controlled charging time, 2067
Otto, W., signal sampler for p.p.i. transmission, 1921
Oudin, J., with J. Icole, time analysis and filtering, 2322
van Overbeek, A. J. W. M., with others, decade-counter valve for high counting rates, 3614
Overbury, F. G., airborne receivers SR.14/15 and test gear for instrument landing systems, 3098
Ozawa, Y., with K. Higasi, h.f. loss in dielectrics, 767

P

Paehr, H. W., approximate formulae for alignment of superheterodyne receivers, 3540
Page, C. H., instantaneous power spectra, 2326
Page, H., with P. A. T. Bevan, Sutton Coldfield television station, 854
Paghis, I., surface losses in e.m. cavity resonators, 3042
Pakala, W. E., with others, investigation of interference from h.v. lines, 257
Pakswer, S., and W. O. Reed, photoconductivity of composite photoemissive cathodes, 859
Palmer, L. S., radiation or diffraction patterns near receiving aerials, (D)2187
—— with A. Cownie, effect of moisture on permittivity of soil, 2793
Pan, Wen Yuan, interference in u.h.f. receivers, 2642
Panetti, M., with R. Malvano, detection of small variations of Q of cavity resonator, 192
Pannett, W. E., Radio Installations, (B)500
Pantchechnikoff, J. I., large-area Ge photocell, 2656
Papian, W. N., coincident-current magnetic digital-storage system, 2258
Papineau, A., stability of G-M counters, 465
Parbrook, H. D., and E. G. Richardson, ultrasonic propagation in CO_2 and C_2H_4 near critical point, 3310
Parcelier, P., frequency multiplier giving 1-kc/s signal synchronized by pendulum chronometer, 2262
Parchment, E. D., microgroove recording and reproduction, 2976
Park, J. H., beam intensification for h.v. oscillograph, 739
Parker, A. B., with F. L. Jones, mechanism of spark breakdown in air, 3405
Parker, C. V., charge storage in c.r. tubes, 554
Parker, D. J., with others, image-orthicon colour-television camera optical system, 2907
Parker, P., Electronics, (B)290
Parkin, P. H., acoustics of Royal Festival Hall, London, 567
—— and J. H. Taylor, speech reinforcement in St. Paul's cathedral, 1506
—— W. E. Scholes and A. G. Derbyshire, reverberation times of 10 British concert halls, 3320
—— with W. A. Allen, acoustics and sound exclusion, 13
—— with others, measurement of indirect sound transmission in buildings, 11
Parodi, M., stability, 332, 333; integration of equations of propagation along heterogeneous line, 2706
Parry, C. A., cathamplifier, 2172
Parsons, P. L., with R. Bechmann, piezoelectric properties of partially plated square crystals, 704; mechanical strength of piezoelectric crystals, 3142
Partridge, F. B., with H. White, Australian visual aural radio range system, 1314
Partridge, J. H., and E. Preston, technical control in glass manufacture, 1351
Parzen, P., space-charge waves in cylindrical waveguides with many beams, 911; equivalent temperature of electron beam, (D)1780; space-charge-wave propagation in cylindrical electron beam, 2371; effect of thermal-velocity spread on noise figure of travelling-wave valves, 2934
—— and L. Goldstein, effect of hydrostatic pressure in electron beam on operation of travelling-wave valves, 1151; current fluctuations in d.c. gas-charge plasma, 1891
—— with others, periodic-waveguide travelling-wave amplifier for medium powers, 1153
Parziale, A. J., with others, electrical conductivity of air in troposphere, 1289
Päsler, M., with others, impulse integral and Duhamel step integral, 1352
Patai, I. F., and M. A. Pomerantz, contact potential, 1263
Patchett, G. N., line eliminator using 'spot stretching', 2634; phase-angle meter, 2857, (D)2858; faulty interlacing, 2918
Patremio, S. P., Du-mitter television transmitter for feeding groups of receivers, 2346
Patten, R., with others, electrical conductivity of air in troposphere, 1289
Patton, P. B., with B. R. Tupper, multichannel telephony on v.h.f. radio links, 3233
Paul, W., D. A. Jones and R. V. Jones, infrared transmission of galena, 703
Paulsen, G., medium-wave broadcasting coverage in NWDR area, 3238
Pauthenet, R., with L. Néel, thermomagnetic study of single-crystal α-Fe_2O_3, 3125
Pavel, E. A., broadcasting cables to C.C.I.F. recommendations, 28
—— and H. Liersch, control and measurement equipment for the broadcasting-network repeater stations of the German post office, 1726
—— H. v. Schau and W. Schwenn, Type-48 line amplifier for programme transmission, 1238
Pavel, G., design charts for low-power mains transformers, 1527
Pavlasek, T. J. F., and F. S. Howes, resistors at r.f., 1530
Pawsey, J. L., interstellar H 1420-Mc/s line and galactic rotation, 982
—— L. L. McCready and F. F. Gardner,i onospheric thermal radiation at r.f., 406
Payne-Scott, R., and A. G. Little, solar r.f. sources at 97 Mc/s, observations of, 1902, movement of, across sun's disk, 2781
—— with A. G. Little, equipment for observation of solar r.f. sources at 97 Mc/s, 1901
Peachey, F. A., with others, automatic monitoring of broadcast programmes, 269
Pearcey, E. J., overtone crystal oscillator for prevention of television interference, 856
Pearson, G. L., and H. Suhl, magnetoresistance of oriented single Ge crystals, 166
—— W. T. Read and W. Shockley, probing space-charge layer in p-n junction, 2526
—— with others, effects of pressure and temperature on resistance of Ge p-n junctions, 1324
Pearson, H. E., quartz crystal vibrators, 1239
Pease, M. C., iterated network and application to differentiators, 2457
Peck, D. S., cold-cathode glow-discharge valve, 2071
Pecker, J. C., with others, observations of solar eclipse, 25th Feb. 1952, 2785
Pedersen, G., R/T link Copenhagen-Skamlebaek, 1105; planning of new broadcasting stations in Denmark, 1736; wavelength problems in broadcasting and television, 3227
Pei-Su Hsia. See Hsia, Pei-Su.
Pelz, F. M., reduction of branched circuits, 937
Penndorf, R., absorption of solar energy by O_2 molecules in E layer, 986
Pentz, M. J., with others, coil system for air-cored betatron, 2566
Perers, O. F., B. K. C. Stjernberg and S. K. H. Forsgren, microwave propagation in optical range, 789
—— with S. K. H. Forsgren, recording of rain by radar, 681
Peretz, R., sawtooth-wave generator, 2165
Pérez, J. P., temperature variation of dielectric constant of quartz at h.f., 2831
—— with A. Michels, frequency shift of quartz under high pressure, 1350
Pernet, P., field-strength measurements near discontinuity, 2013
Pernik, J., batteries and accumulators in telecommunications, 2624
de la Perrelle, E. T., with F. L. Jones, cold emission of electrons in spark gaps, 98
Perrins, A. R., with C. Süsskind, c.r.o. plotter for microwave fields, 448
Perrot, M., and J. P. David, effect of electric field on development of thin films, 2826
—— and J. Tortosa, conductivity of Si films, 3451
—— with others, thin C films, conductivity of, 171, flicker effect in, 341; properties of thin films of Ag, Al and Si, 2537
Perry, G. H., c.r.-tube storage for parallel computer, 1174
Perry, R. E., field/power conversion chart, 245
Persson, L., radio links for power stations, 2031
Pétermann, L., phosphorescent materials for detection of ultrasonic waves, 1810
Peters, J., carrier-frequency systems free from linear distortion, 1725
Peters, R. G., periodic colour sequence in television, 1129; u.h.f. television transmitter and aerial design, 1449; u.h.f. instrumentation, 1682; measurement of radar characteristics of targets, 2512
Peterson, A. M., with O. G. Villard, Jr, instantaneous prediction of radio transmission paths, 2579
—— with others, studying sporadic-E clouds, 3080
Peterson, A. P. G., single-end push-pull a.f. amplifier, 1558; Type 1390-A random-noise generator, 1987
—— and D. B. Sinclair, single-end push-pull a.f. amplifier, 1250
Peterson, D. W., with others, omnidirectional high-gain u.h.f. aerials, 3001
Peterson, H. A., with P. E. Russell, harmonic power generators, (A)812
Pethke, H., with D. Bünemann, applications of f.m. pulse trains, 3589
Petrie, D. P. R., with D. R. Chick, helix as linear accelerator for protons, 1694
Petrie, R. D., B.B.C. disk-reproduction desk, 899
Pettit, J. M., u.h.f. triode oscillator using series-tuned circuit, 3046
Pfefferl, A., with others, high-power f.m. broadcasting transmitters, (C)534
Pfeifer, F., with F. Assmus, resistance anomalies in supermalloy, 691
Pfister, J., measurement of interference voltages, 1029
P[illegible], W., calculation of h.f. band-pass filters with n coupled circuits, 2753
Phelp, N. R., with L. C. Jesty, television picture quality, 275, (C)1126, 1127, 2920
Phillips, F. M., with E. B. Moullin, current induced in conducting ribbon by incident plane e.m. wave, (A)2441, 2723
Phillips, G. J., measurement of winds in ionosphere, 1916
Phillips, W. E., permittivity of air at λ 10 cm, (D)1957
Picard, E., A. Rogozinski and M. Surdin, radio link for studying coincidences between pulses, 1731
Picht, J., theory of optical method of sound analysis, 1499
Pick, B., with A. Kolarz, u.s.w. frequency converter for relay station, 2646
Picquendar, J. E., electron guns for travelling-wave valves Types M8 and M11, 2938
Piddington, J. H., formation of ionospheric layers, 128, origin of galactic r.f. radiation, 390
—— and H. C. Minnett, solar r.f. emission from high-temperature regions, 116; r.f. radiation, from galaxy, 1·21 and 3 kMc/s, 1906, from Cygnus, 2788
Pidduck, F. B., diffraction of light by semitransparent sheet, 1883
Pieplow, H., RC networks as filters, 1542
Pierce, E. T., with P. G. F. Caton, waveforms of atmospherics, 2809
Pierce, J. R., waves in electron streams and circuits, 106; parallel-beam electron gun, 1171
—— and A. L. Hopper, nonsynchronous pulse multiplex system, 3555
Piesch, J., evaluation of communication and transmission methods, 2327
Pietermaat, F. P., W. van Dyck, and F. de Keuster, dielectric constant of diamond, 3143
Piétri, G., ribbon-beam valves, 2389
Pigg, J. C., with others, neutron bombardment of Ge, effect of, 163, production of hole traps by, 1637
Piggott, W. R., with E. V. Appleton, statistics of storms in F_2 layer, 2802
Pike, R. G., with A. Van Valkenburg, synthesis of mica, 3149
Pike, W. S., with others, portable television pickup equipment, 2911
Pikus, G. E., influence of surface energy levels on semiconductor properties, 3401
Pilz, P., with H. H. Rust, generation of ultrasonic oscillations by means of ferromagnetic sediments, 1183
Pimonow, L., improved ultrasonic siren, 1498
Pinasco, S. F., electronic switch, 63
—— with K. Franz, Q meter based on free damped oscillations, 1676
Pincherle, L., energy levels of F centres, 420; activation energy and impurity concentration in semiconductors, 423
Pineo, V. C., and T. N. Gautier, frequency dependence of duration of meteor-trail echoes, 1592
Ping King Tien. See Tien, Ping King.
Pinkham, J. M. C., with others, London/Birmingham television radio-relay link, 820
Piper, W. W., and F. E. Williams, electroluminescence of single crystals of ZnS-Cu, 3439
Pipes, L. A., analysis of parallel-connected magnetic amplifiers with resistive loads, 3014
Pircher, G., u.h.f. discriminator and application to klystron frequency stabilization, 59
Pirker, F., low-power ultrasonic generator, 5
Pistoulet, B., ferromagnetic resonance and complex-permeability diagram, 1273; magnetic amplifiers and recent improvements, 2132; properties of ferromagnetic powders at frequencies up to 24 kMc/s, 2236
Pivano, L., Turin-Piacenza experimental radio link, 808
Plasencia, H. Tellez. See Tellez Plasencia, H.
Plessner, K. W., conductivity and Hall effect, of microcrystalline Se containing I_2, 696, of Se crystals, 697
Ploke, M., theory of 3-element electron guns, 2087, 2944; amplification by photoconductive cells, 3196
Pocock, S. N., series-parallel voltage stabilizers, (D)2901
Poehler, H. A., effect of core material on emission of oxide cathodes, 2079
van der Poel, W. L., simple electronic digital computer, 2253
Poeverlein, H., influence of geomagnetic field on ionospheric propagation, 781; waves in anisotropic media, 2007
Pohl, R. G., with C. S. Szegho, television picture tubes with iron envelopes, 1790
Pohl, R. W., demonstration of standing waves in free acoustic field, 1489
Pohontsch, H., common-wave broadcasting and hyperbolic navigation, 2515, 3437
Poincelot, P., current distribution along cylindrical aerial, 2119; concept of group velocity, 2179, 3420
Pokrovski, Ya. E., pulsed operation of oxide cathode, 550
Poleck, H., fundamental wave filter for measurement equipment, 352; balance in a.c. measurements, 1660
Pollack, L., measurement of loudness of white noise, 1501; repeated bursts of noise, threshold and loudness of, 1502, sensitivity to differences in intensity of, 1503; loudness scale for speech sounds, 2693
Pollock, A. M., thorn needles, (D)2422
Polonsky, J., L. Amster and G. Melchior, C.S.F. television transmitters, 3378
Polydoroff, W. J., ferromagnetic loop aerials, 1520
Pomerantz, M. A., and J. F. Marshall, fundamentals of secondary-electron emission, 656
—— with I. F. Patai, contact potential, 1263
Pores, E. B., problems in mobile television, 514
Porter, A., An Introduction to Servomechanisms, (B)510
Post, E. J., HT cut for quartz crystals with zero temperature coefficient, 1641; safe current for piezoelectric elements, 2757
Post, R. F., performance of pulsed photomultipliers, 3209
Postgate, M. M., symposium on maintenance of standards, 1362
Poté, A. J., r.f. units for synchrocyclotron, 1070
—— with others, dee-bias system for f.m. cyclotron, 762
Potier, G., pulse technique in complex transmission networks, 2604
Potter, J. L., with L. A. Rosenthal, self-balancing microwave power-measuring bridge, 204
Potter, R. K., frequency analysis of a.f. atmospherics, 416
Potts, J., with J. C. West, simple variable-frequency phase meter, 3510
Power, B. D., with D. Latham, vacuum technique and its application in radio and electronics, 1928
Prache, P. M., magnetic cores and sheaths in telecommunications, 2946, 3479
Preist, D. H., u.h.f. coaxial tetrode, as television amplifier, 2175, for high-power frequency multiplication, 3048
Pressler, H., report of C.A.E.R. conference, Geneva, 1951, 2599
Preston, E., with J. H. Partridge, technical control in glass manufacture, 1351
Pridmore-Brown, D., with U. Ingård, sound propagation in duct with constrictions, 1492
Prim, R. C., partial differential equations, for flow of holes and electrons in semiconductors, 1010, for current in intrinsic semiconductors, 1626
Prince, M. D., with M. A. Honnell, television-image reproduction by use of v.m. principles, (D)2630
Pringsheim, P., activation susceptibility of K and Na halide phosphors, 1318
Pritchard, R. L., radiation from circular emitter, 295
Proctor, R. F., bridged-T impedance bridge for v.h.f., (A)2557, 3598; input impedance of horizontal dipoles near ground, 2722
Prokott, E., high-power pulse generator with controlled spark-gap, 612
Provenza, G., present and planned broadcasting service for Italy, 805
Prowse, W. A., and W. Jasinski, electrical breakdown of gases at 2·8 kMc/s, 650, 2774
Puhlmann, W., magnetic processes in recording apparatus, 901
Pujolle, J., acoustic treatment of new studios of Radiodiffusion Française, 3318
—— and R. Lamoral, f.m. in architectural acoustics, 3317
Pulvari, C. F., electrostatically induced permanent memory, 752
Purcell, E. M., with H. I. Ewen, radiation from galactic H at 1420 Mc/s, 981
—— with others, new kind of v.h.f. radio propagation over long distances,

[illegible]
Purcell, J. D., with others, measurements in rockets of solar ultraviolet radiation, **115**; atmospheric ozone distribution to 70 km height, [illegible]
Purkis, H. J., with others, measurement of indirect sound transmission in buildings, **11**
Pusch, G., common-aerial operation at dm λ, **3036**
Putley, E. H., electrical conductivity of single crystals of PbS, PbSe, and PbTe, **3140**
—— and J. B. Arthur, PbS, an intrinsic semiconductor, **425**

Q

Queen, I., multivibrators using transistors, **1555**
de Quervain, A., carrier-frequency transmission on h.v. lines, s.s.b., **1728**, attenuation due to hoar-frost, **1825**

R

Rabin, B. M., A. M. Strashkevich and L. S. Khin, electron-optical systems with apertures deviating from ideal, **1076**
Rabinow, J., and E. Codier, gramophone needle-drag distortion, **2428**
Raburn, L. E., glide-path cavity aerial for jet fighter aircraft, **921**
Racker, J., with S. Moskowitz, Pulse Techniques, **(B)1567**
Radcliffe, F. E., travelling-wave amplifier measurements, **212**
Radford, W. H., with others, assessment of speech-reinforcement systems, **572**
Raes, A. C., progress in architectural acoustics, **3316**
Raffle, J. F., and E. J. Robbins, nonlinear amplification in E.M.I. photomultipliers, **3272**
Rainich, G. Y., Mathematics of Relativity, **(B)1590**
Raisbeck, G., design of transistor circuits, **1218**
Rajan, V. D., with others, scattering of radio waves in ionosphere, **779**
Rajchman, J. A., static magnetic matrix memory and switching circuits, **3155**
Ramberg, E. G., elimination of moiré effects in tricolour kinescopes, **3261**
Rambøll, B. J., with I. G. Hannemann, construction and erection of aerial masts, **1736**
Ramer, L. G., with D. B. Callaway, use of perforated facings in low-frequency resonant absorbers, **2697**
Ramsay, J. F., circular polarization for c.w. radar, **2811**
Ramsay, J. V., with others, dielectric constant and electron density in gas discharge, **651**
Ramsay, N. F., with others, dee-bias system for f.m. cyclotron, **762**
Ramsey, W. E., slow discharge in non-self-quenching G-M counter, **766**
Ranc, G., with A. Colombani, influence of support on crystallization of thin gold films, **172**
Rand, P. S., J. J. Lamb and A. J. Riley, elimination of r.f.-heater television interference, **1459**
—— A. J. Riley and J. J. Lamb, curing industrial television interference, **1144**
Rang, O., with G. Möllenstedt, e.s. lens as velocity filter, **461**
Rank, D. H., R. P. Ruth and K. L. Vander Sluis, determination of velocity of light by band-spectrum method, **3053**
Rankowitz, S., with W. A. Higinbotham, combined beam-current indicator and integrator, **1039**
Rantzen, H. B., F. A. Peachey and C. Gunn-Russell, automatic monitoring of broadcast programmes, **269**
Rapoport, G. N., dispersion in waveguide filters with slot couplings, **2712**
Raskin, A., with others, e.s. generator giving over 1 MV and using glass-dust stream, **3517**
Ratcliffe, J. A., quick method for analysing ionospheric records, **1292**; regularities in F_2 region, **1294**
Rateau, J., applications of differentiating circuits to control problems, **1688**
Rathbone, R. R., pulse standardizer, **1524**; variable-frequency clock-pulse generator, **1683**; video probe for pulse-circuit testing, **2278**
—— and R. L. Best, pulse mixing unit, **1523**; multivibrator frequency divider, **1871**
Ratheiser, L., frequency limits for oscillators using grid-controlled valves, **83**; Rundfunkröhren, Band 1951, Eigenschaften und Anwendung der neuen UKW-Röhren, **(B)1484**
Rathenau, G. W., with others, ferroxdure, **2824**
Rau, K. L., with H. Katz, thermionic data for some capillary metal cathodes, **1155**
Rave, W., maximum bandwidth of quartz-lattice filters, **1235**
Rawer, K., lateral deflection of e.m. waves reflected by inhomogeneous ionosphere layer, **244**; comparison of ionospheric absorption results at two European stations, **984**; physics of ionosphere, **2217**
—— and E. Argence, characteristics of E region, **1601**
—— K. Bibl and É. Argence, determination of collision frequencies in E and F regions, **987**
—— with M. Barré, ionospheric observations near Adélie Land, **399**; unusual ionospheric disturbance observed in Adélie Land, **1293**
—— with K. Bibl, contributions of D and E regions in measurements of ionospheric absorption, **985**
—— with L. Huber, 'best' pulse receiver, **(C)364**
—— with H. Neyer, variation of angle of arrival with sunspot cycle, **475**
—— with others, electron distribution in ionosphere and s.w. absorption, **1300**; field strength of waves reflected by ionosphere, **2318**
Rawson, H., sealing sapphire to glass, **178**; theory of stresses in glass butt seals, **(D)2249**
Raymond, F. H., Hilbert transforms and Bayard-Bode relations, **1230**
Raymond, R. C., with J. L. McLucas, power spectrum of narrow-band noise after passage through a nonlinear impedance, **1095**
Read, W. T., with others, probing space-charge layer in *p-n* junction, **2526**
Rector, R. V., and W. E. Sutter, microwave systems for 960 Mc/s and 2 kMc/s, **3229**
Reder, F., with others, measurement of dielectric constant of fluids at cm λ, **1664**
Redhead, P. A., effect of ion bombardment on emission from oxide-coated cathodes, **1157**
Redheffer, R. M., R. C. Wildman and V. O'Gorman, computation of dielectric constants, **3166**
Redman, R. O., observations in Sudan of solar eclipse, 25th Feb. 1952, **2784**
Redshaw, S. C., 3-dimensional electrical potential analyser, **1358**, **(D)2257**
Reed, W. O., with S. Pakswer, photoconductivity of composite photoemissive cathodes, **859**
Reeves, J. J., with others, U.S.A. standard on colour television, **831**, **1447**
Regener, E., variations of ozone in troposphere and stratosphere, **1911**
Regenstreif, É., independent e.s. lens, nearly symmetrical, theory of, **1072**, with minimum elliptical astigmatism, **1390**, third-order rays in, **2001**; theory of elliptical e.s. lens for transgaussian conditions, **1391**
Reggia, F., magnetic attenuator for u.h.f., **1237**
Regnault, F., and others, semiconducting properties of molybdenite, **3454**
Reich, E., definition of information, **1423**
Reichardt, W., exact equations for negative feedback, **368**; mechanical-electrical analogies, **2178**
—— with others, impulse integral and Duhamel step integral, **1352**
Reichel, W., summary and comment on standard 50 IRE 23.S1, **516**
Reimann, A. L., and J. V. Sullivan, rectification phenomena with natural and sulphurized galena, **3473**
Reingold, I., J. L. Carter and K. Garoff, single- and multi-iris resonant structures, **2708**
Rettinger, M., R.C.A. 10794 magnetic recording head, **25**
Reutersward, C., power supply for thermionic ion source, **3515**
Rey, T. J., pulse-coded computers, **1651**
Reynolds, D. K., and W. S. Lucke, corrugated end-fire microwave aerials, **922**
Rheaume, R. H., coaxial triode for 50-kW output up to 110 Mc/s, **3610**
Ribeiro, J. C., thermodielectric effect, **648**
Riblet, H. J., short-slot hybrid junction, **1833**; superdirectivity with directional-coupler arrays, **(D)2990**
Rice, P. L., with K. A. Norton, gapless coverage in air-to-ground communications at frequencies > 50 Mc/s, **2334**
Rice, S. O., reflection of e.m. waves from slightly rough surfaces, **664**
Richards, D. L., principles of design and analysis of experiments, **437**; design and analysis of subjective acoustic experiments, **2968**
Richards, J. C. S., stabilized a.c. supply for lamps and valve heaters, **1742**
Richardson, E. G., ultrasonics in fluids, **7**
—— with H. D. Parbrook, ultrasonic propagation in CO_2 and C_2H_4 near critical point, **3310**
Richardson, H. K., a.f. equipment at 1952 I.R.E. show, **2699**
Richardson, H. O. W., use of current sheets in design of magnets, **2247**; electrolyte-tank method for studying magnetic fields, **2284**
Richardson, R. C., straight-line-flight indicator for radar-equipped aircraft, **144**; aided layer for shoran, **2518**
Richardson, W. D., and W. N. Anderson, cross-channel television, **821**
Riche, P., with Y. Angel, Paris-Lille television radio link, **2627**
Rickaby, F. I., with C. P. Beanland, Marconi s.s.b. receivers, Types HR92 and HR93, **2878**
Riddiford, L., notes on ionization gauge, **1927**
Rideout, V. C., with others, study of oscillator circuits by analogue-computer methods, **943**
Ridler, D. S., with G. H. Hough, cold-cathode glow-discharge tubes and circuits, **2933**
Riebman, L., with J. Broomall, sampling analogue computer, **2546**
Riedel, O., Geiger counters with Xe/O filling, **1399**
Riéty, P., frequency comparator, **1679**
Riley, A. J., with others, elimination of r.f.-heater television interference, **1144**, **1459**
Rinehart, R. F., design of rapid-scanning radar aerials, **2445**
Ring, F., transmission characteristics of V60 carrier-frequency equipment, **2596**
Rittner, E. S., and F. Grace, impedance measurements on PbS photoconductive cells, **3595**
Rivère, P., and M. Schwindenhammer, equipment of Dijon-Strasbourg radio beam link, **2613**
Rizzoni, E., overvoltage effect in r.f. power amplifiers, **1560**
Robbins, E. J., with J. F. Raffle, nonlinear amplification in E.M.I. photomultipliers, **3272**
Robbins, J. G., significance of harmonics in sound source in room, **3319**
Robbins, R. C., with others, magnetostriction storage system for digital computer, **1200**
Robeer, A. G., and B. Swets, 40-kW broadcasting transmitter, **1461**
—— and W. L. Vervest, water jacket for large transmitting valves, **1473**
Roberts, A., microwave lighthouse, **3094**
Roberts, E. A., and P. Goldsmith, piezoelectric crystals for pressure, temperature and humidity measurements, **(A)1058**
Roberts, F. F., with G. O. Jones, spontaneous magnetization of Mg ferrite and Mg ferrite-aluminate powders at low temperature, **3120**
Roberts, G. E., design and development of Decca flight log, **2224**
Roberts, J. E., and H. F. Cook, microwaves in medical and biological research, **2292**
Roberts, S., piezoelectric effect in $PbZrO_3$, **1019**
Roberts, W. K., with E. W. Chapin, reduction of television receiver oscillator radiation, **3264**
Robin, S., with others, electron multiplier for ultraviolet range down to 1450 Å, **2369**; characteristics of photomultiplier using Cu-Be alloy, **3594**
Robinson, A. A., with others, circuits for universal high-speed digital computer, **2838**
Robinson, A. T., and J. E. Dorn, effect of alloying elements on resistivity of Al alloys, **1646**
Robinson, F. N. H., space-charge smoothing of microwave shot noise in electron beams, **2396**; v.m. detector, **2884**
—— and R. Kompfner, noise in travelling-wave valves, **546**
Robl, H., with W. Glaser, rigorous calculation of typical e.s. electron lenses, **1698**
Robson, D. W., group-combining filters for 12- and 24-channel carrier systems, **71**
Rocard, Y., with J. F. Denisse, excitation of electron oscillations in a shock wave, application to radio astronomy, **1900**
Rochelle, R. W., transmission-line pulse inverter, **3361**
Rocherolles, R., with J. Desauty, investigations of slot-aerial fields, **48**
Roddam, T., calculation of amplifier transient response, **2762**
Rodenhuis, K., with G. Diemer, geometry of microwave amplifier valves, **2377**
Roderick, R. L., and J. Truell, measurement of ultrasonic attenuation in solids by pulse technique, **2099**
Roe, J. H., video levels in television broadcasting, **833**
Roessler, E., hyperbolic navigation in Germany, **1311**; action of locked oscillators, **2474**
Roetken, A. A., K. D. Smith and R. W. Friis, TD-2 microwave radio relay system, **1109**
Rogers, D. C., triode amplifiers for 100–420 Mc/s, **2086**
Rogers, F. T., Jr, with others, factors influencing dielectric properties of $BaTiO_3$ ceramics, **2244**
Rogers, T. F., with S. J. Johnson, magnetically induced ultrasonic velocity changes in multicrystal Ni, **2818**
Rogozinski, A., directive effect in G-M counters, **464**
—— with J. Weill, properties and applications of inverted triode, **2263**
—— with others, radio link for studying coincidences between pulses, **1731**
Rohde, L., H. Nitsche and A. Pfefferl, high-power f.m. broadcasting transmitters, **(C)534**
Romand, J., V. Schwetzoff and B. Vodar, applications of ultraviolet absorption in vacuum technique, **419**
Romanowitz, H. A., and W. G. Dow, statistical and physical concepts of thyratron deionization time, **2387**
Romanowski, M., and A. F. Dunn, sensitivity of bridge networks, **3506**
van Roosbroeck, W., with others, thermally produced acceptors in Ge, **2235**
Rorden, W. L., with O. G. Villard, Jr, flexible selectivity for communication receivers, **2015**
Rose, A., analysis of photoconductive processes, **1005**
Rose, C. F. P., with others, amplifiers for multichannel s.s.b. transmitters, **2923**
Rose, D. J., and S. C. Brown, properties of ionized gases at h.f., measurement of electric field, **3489**
—— with S. C. Brown, properties of ionized gases at h.f., measurement of *Q*, **3496**
Rose, F., resistance stratification in Cu_2O rectifiers, investigation of massive plates, **271**, investigations on rectifier disks, **272**
—— with others, reversible changes in Se rectifiers, **1642**
Rosenthal, J. E., correction of spot distortion in c.r. tubes, **(D)2088**
Rosenthal, L. A., a.f. wide-range sweeping oscillator, **360**
—— and G. M. Badoyannis, r.m.s. valve voltmeter, **3502**
—— and J. L. Potter, self-balancing microwave power-measuring bridge, **204**
Ross, G. I., with others, field-strength survey for Wrotham 90-Mc/s transmitter, **240**
Ross, H. McG., with others, developments in electronic magnetometers, **1857**
Ross, W., and F. Horner, Radio Research Special Report No. 22, Siting of Direction Finding Stations, **(B)2227**, **(B)3099**
Rossel, J., with H. Ess, ionization pulses and charge transport mechanism in diamond, **769**
Rost, R., temperature-independent Ge-W diodes, **2943**
Rothe, H., and E. Gundert, effect of electron transit-time on efficiency of transmitting tetrodes, **3612**
Rothlein, B. J., photovoltaic Ge cell, **1468**
Rotman, W., single-surface corrugated waveguides, **33**
Roubine, E., e.m. field of helices, **1580**; spectroscope for mm waves, **2260**
Roulaud, R., ion burn in c.r. tubes and its elimination, **3613**
Round, H. J., magnetostriction transducer measurements, **1494**
Rowden, R. A., with others, field-strength survey for Wrotham 90-Mc/s transmitter, **240**
Rowe, E. G., reliability of valves, **1776**
Rowlands, R. O., composite ladder filters, **1544**
Roy, R., with B. M. Banerjee, timebase circuit for precision ionospheric recorder, **2477**
Royden, G. T., suppression of harmonics in radio transmitters, **(C)2063**
Rozhdestvenski, B. L., e.m. waves in flat horn, **46**
—— and D. N. Chetaev, elimination of reflections in waveguides with varying cross-section, **1832**
Rubin, S., and G. E. Boggs, Type-6BN6 valve as mixer, **794**
Rücklin, R., theory of resistance-coupled amplifier, **2763**
Rudd, J. B., transfer impedance of recurrent networks, **939**
Rudnick, I., with R. B. Lawhead, acoustic wave propagated along boundary, **296**, **297**
Ruhrmann, A., reactance of mismatched resonant lines, **321**; balancing and transformation with coaxial lines, **1827**; h.f. phase measurement with direct indication, **1980**
Rukop, H., and H. Kaiser, natural frequencies of coupled circuits, **78**
Rülker, E., modulation meter, **2859**
Runcorn, S. K., and others, variation with depth of geomagnetic field, **1596**
—— with F. J. Lowes, analysis of geomagnetic secular variations, **671**
Runge, W., M. Strohhacker and A. Troost, Telegon direction finder, **139**
—— with others, comparison of frame coils and stretched-wire loops for ship d.f., **2517**
Ruppel, W., common-aerial transmission and reception of circularly polarized microwaves, **281**
—— with W. Kleen, travelling-wave valve, delay line as component of, **2375**, calculation of noise figure of, **3276**
Russell, P. E., and H. A. Peterson, harmonic power generators, **(A)812**
Rust, H. H., rotating radio beacon with angle-dependent frequency, **1001**; ultrasonic generators for industrial purposes, **2965**
—— and E. Bailitis, linear magnetostrictive ultrasonic generators using crossed magnetic fields, **3308**
—— and P. Pilz, generation of ultrasonic oscillations by means of ferromagnetic sediments, **1183**
—— with W. Spengler, simultaneous generation of audio frequencies by multi-electrode valve, **2044**
Ruston, J., measurement of television transmitter amplitude characteristics, **1133**; improving television system transient response, **3253**
Rutelli, G., tuned transformers and filters of maximum bandwidth, **1863**
Ruth, R. P., with others, determination of velocity of light by band-spectrum method, **3053**
Rutishauser, H., solution for $\int e^{\lambda(x + a\cos x)}dx$, **431**
Rutland, D. F., and J. J. Gilvarry, general theory of voltage stabilizers, **814**; general theory of current stabilizers, **2623**
Rydbeck, O. E. H., theory of magneto-ionic triple splitting, **1913**
—— and S. K. H. Forsgren, theory of electron-wave valves, **2077**
Ryder, E. J., with others, Zener current in Ge *p-n* junctions, **164**
Ryder, F. L., network analysis by least-power theorems, **3370**
Ryle, M., radio interferometer for observation of weak radio stars, **2497**
—— and B. Elsmore, long-period variations in intensity of radio stars, **979**
—— F. G. Smith and B. Elsmore, radio stars in northern hemisphere, **121**
—— with others, equipment for measuring small r.f. noise powers, **2560**
Rynd, N., with P. K. Weimer, 45°-reflection-type colour kinescope, **846**
Rzhevkin, S. N., acoustic diffraction at sphere and reciprocity theorem, **2676**

S

van Sabben, D., with B. van Dijl, radio propagation between New York and Amsterdam, **3213**
Sabine, P. E., acoustics of remodelled House and Senate Chambers of the Capitol, Washington, **2421**
Sacasa, R. Gea. See Gea Sacasa, R.
Sacco, L., calculations for m-λ links beyond optical range, **1410**
Sacerdote, G. G., with A. Bressi, acoustic absorption of porous material, **12**
—— with C. Tutino, broadcasting studios with sound-diffusing walls, **569**
Sachtleben, L. T., and G. L. Allee, ultra-speed theatre-television projection systems, **1453**
—— and others, image-orthicon colour-television camera optical system, [illegible]
Sack, R. A., dielectric properties of systems containing straight polar chains, **2772**
Saenger, E., with others, ionization and luminescence of flames, **657**
Saha, M. N., B. K. Banerjea and U. C. Guha, vertical propagation of e.m. waves in ionosphere, **243**
Saic, F. C., integration of European air-navigation safety systems, **3095**
Saker, E. W., with H. K. Henisch, effect of Hg on Se, **2539**
Sakiotis, N. G., A. J. Simmons and H. N. Chait, microwave-aerial ferrite applications, **2721**
Sala, O., resonance effects with short trains of sound pulses, **1185**
Salisbury, W. W., with others, new kind of v.h.f. radio propagation over long distances, **2581**
Salka, O., with H. Norinder, impulse resistance of earth electrodes and embedding materials, **428**; mechanism of long-gap positive spark discharges in air, **3403**
Salmon, J., application of matrix calculus to feedback systems, **2145**
Salow, H., Ge triode, **553**
Salunina, A. E., with others, properties of blue TiO_2, **1344**
Salvadorini, R., repeater coils for line transmission of music, **2469**
Salvage, B., and T. R. Foord, h.v. Schering bridge for dielectrics research, **3507**
Salz, N. P., with L. S. Schwartz, analysis of non-recurrent pulse groups, **1721**
Salzberg, C. D., and R. Greenstone, systematic ionospheric winds, **1296**
Samal, E., double-T networks for null measurements at h.f., **794**
Sánchez-Cordovés, J., Marconi orthicon camera, **523**
Sander, K. F., C. W. Oatley and J. G. Yates, factors affecting design of automatic electron-trajectory tracer, **2852**
Sanderson, W. T., random phase variations of c.w. signals in 70–130-kc/s band, **2583**
van Santen, J. H., and G. H. Jonker, piezoelectric properties of $BaTiO_3$, **1624**
Saraga, W., approximations in network design, **3371**
—— and L. Fosgate, graphical methods for analysis and design of filters, **1546**
Sartorius, H., with R. C. Oldenbourg, Dynamik selbsttätiger Regelungen, Vol. 1, **(B)511**
Sasaki, W., with others, a.c. characteristics of Si *p-n* junctions, **1323**
Saski, T., with others, *p-n* transition in (BaSr)O cathode, **1472**
Sass, E., with D. Mackey, printed components in television tuner, **1139**
Sato, A., with others, vibrating-capacitor electrometer, **3500**
Sato, G., with others, transmission efficiency of long feeder lines for v.h.f., **2116**
Sato, R., and K. Nagai, design of directive aerial with single reflector, **3352**
—— with others, transmission efficiency of long feeder lines for v.h.f., **2116**
Sato, T., and H. Kaneko, physical properties of Se, **1336**; characteristics of Se rectifiers, **2340**
—— with others, *p-n* transition in (BaSr)O cathode, **1472**
Sator, A., reversible cell with electrolyte a thin crystal plate deposited by evaporation, **3571**
Sauber, J. W., h.f. characteristics of resistance-coupled triode amplifiers, **1251**
Savornin, J., and F. Fourrier-Savornin, sign of thermal e.m.f. of Si, **3132**
Sawade, S., problems of room acoustics, **1188**; sound-radiator-array technique, **1322**
—— with F. Bergtold, 'physiological volume-control' in broadcasting reception, **486**
Sawaguchi, E., H. Maniwa and S. Hoshino, antiferroelectric structure of $PbZrO_3$, **1018**
Saxon, D. S., with R. E. Holzer, distribution of conduction currents near thunderstorms, **2807**
—— with others, radiation characteristics of turnstile aerial shielded by tube, [illegible]
Saxton, J. A., propagation of m-λ waves beyond horizon, **941**; dielectric properties of water and methyl and ethyl alcohols at u.h.f., **3400**
—— and J. A. Lane, electrical properties of sea water, **3424**
—— G. W. Luscombe and G. H. Bazzard, propagation of m-λ waves beyond horizon, **942**
—— with J. A. Lane, dielectric properties of water and methyl and ethyl alcohols at u.h.f., **3399**
Sayer, W. H., Jr, and E. Mehrbach, u.h.f. television transmitter using coaxial-line cavities, **1448**
Scal, R. K. F., with others, new techniques for electronic miniaturization, **2754**
Scarr, R. W. A., distributed amplification, **(D)2760**
Scarrott, G. G., with G. W. Hutchinson, pulse-height analyser of moderately high speed, **604**
—— with others, mechanical kick-sorter (pulse-size analyser), **54**
Schachenmeier, R., diffraction of e.m. waves near earth's surface, **238**
Schaefer, D. L., and J. E. White, physical processes in *L* cathode, **3290**
Schaetti, N., and W. Baumgartner, Li-Sb photocathodes, **858**; properties of Cs-Sb photocathodes at different temperatures, **3070**
—— W. Baumgartner and C. Flury, photoelectric effect in Cs-Ga, Cs-In and Cs-Tl photocathodes, **2069**
Schafer, C. R., design of industrial metal-detectors, **1065**
Schafer, J. P., with W. J. Albersheim, echo distortion in f.m. transmission of frequency-division multiplex, **2022**
Schäffer, O., and H. Eberhardt, circle-diagram recorder for a.f., **740**
Schaffstein, G., effect of delay distortion on signal waveform, **1860**
Schagen, P., television camera tubes, **1451**
—— H. Bruining and J. C. Francken, image iconoscope, **1754**; e.s. electron-optical system with only one voltage, **3284**

Schalkwijk, J., time-interval measurements on equipment in normal operation, **1950**
Schaller, A., photoelectric amplifiers, **2287**
v. Schau, H., with others, Type-48 line amplifier for programme transmission, **1238**
Scheldorf, M. W., wide-band aerial element, **2117**
Schelkunoff, S. A., general theory of symmetrical biconical aerials, **1516**; generalized telegraphy equation for waveguides, **2709**
Schérer, J., graphical study of quadripoles at constant frequency, **935**
Scheuber, A., with H. H. Meinke, junction units for coaxial cables, **2429**, **2985**
Scheuermann, K., with P. Behrend, practical realization of positive reactance functions, **3366**
Schiaffino, P., comparison between human and artificial ears, **1814**
Schiekel, M., electron-optical velocity filters, **3204**
Schiesser, H., comparison of sound-recording methods, **3330**
—— and H. Gathmann, construction of a.f. amplifiers for studios, **950**
Schikorski, W., with others, u.s.w. propagation and meteorological influences, **3217**
Schilberg, L. E., with others, factors influencing dielectric properties of $BaTiO_3$ ceramics, **2244**
Schilling, H. K., with others, acoustic characteristics of jet-edge systems, **2681**
Schilling, W., magnetic amplifiers, **3362**
Schindelhauer, F., A. Schrader and C. Horinger, calculation of height of lower ionosphere layers from atmospherics waveforms, **990**
Schirman, S., with others, equipment for Paris-Lille television radio link, [illegible]
Schlaack, N. F., LD-T2 R/T transmitter, **2065**
Schlesinger, K., improvement of television picture quality by dot arresting, **513**; 'deflectron' internal e.s. deflection yokes for c.r. tubes, **3290**
Schlivitch, S., fluorescent CdI_2 screen, **1320**
Schmid, O., a.f. signal generators, **188**; linear r.m.s.-value rectifiers, principles of, **339**, theory of, **1217**; calculation of capacitive voltage regulator, **1974**; profile calculation for rotary plate capacitors, **2741**
Schmidl, H., electrolyte tank with automatic recording, **3179**
Schmidt, H. M., cylindrical surface-wave transmission lines, **579**
Schmidt, J., equipment for alignment of ganged variable capacitors, **2861**
Schmidt, K. O., directional aerials, **328**; radio links, dm-wave p.ph.m. system parameters of, **804**, planning of, **1431**, **2033**, multichannel, wartime, from Athens to Rome and Crete, **2607**, dm-λ and cm-λ, and C.C.I.F. requirements, **2896**
Schmidt, W., double-T RC filter, **2148**
Schmitt, G., theory of differential transformer, **57**; equivalent circuits for 6-pole and higher-order-multipole networks, **355**
Schmitt, R. W., adiabatic changes in $BaTiO_3$ at low temperatures, **2945**
Schmitz, W., and L. Waldick, power measurements on ultrasonic quartz oscillators, **734**
Schneider, A. B., phase variations with signal range in 70–130-kc/s band, **2582**
Schneider, G. E., graphical methods for analysis and design, **(D)2751**
Schneider, H., l.f. noise-voltage generator, **721**
Schniedermann, J., long-distance telephony systems in Germany, **491**
Schnitger, H., travelling-wave valves, amplification and generation of microwaves by, **543**, electronic damping in, **545**
Schoch, A., transmission of sound through plates, **2411**; lateral displacement of totally reflected ultrasonic beam, **2414**
Schoeberlein, W., u.s.w. d.f. equipment Type PV-1B at Kloten airport, **141**
Scholes, W. E., with others, reverberation times of 10 British concert halls, **3326**
Scholz, W., effective height of troposphere inversion layers in u.s.w. propagation, **476**
Schönfeld, H., equivalent circuit of magnetostrictive transducer, **1802**
Schonland, B. F. J., work of Bernard Price Institute of Geophysical Research, 1938–1951, **992**
—— and D. J. Malan, distribution of electricity in thunderclouds, **413**
—— with D. J. Malan, distribution of electricity in thunderclouds, **1303**
Schörken, K., with F. W. Gundlach, secondary emission in whole-anode magnetrons, **1791**
Schott, L. O., signal translation in hearing, **2100**
Schottky, W., h.f. properties of boundary-layer rectifiers, **3566**
Schouboe-Madsen, H., R/T communications in Jutland, **1106**
Schouten, J. F., F. de Jager and J. A. Greefkes, delta modulation, **2603**
Schouten, J. P., and H. W. F. van't Groenewout, analysis of distortion in p.c.m. systems, **2332**
—— and H. J. Heijn, subharmonic oscillations in circuits including iron-core reactors, **2155**
—— and A. T. de Hoop, Huyghens' principle in diffraction problems, **2487**
Schrader, A., with others, calculation of height of lower ionosphere layers from atmospherics waveforms, **990**
Schreck, K., constant-frequency h.f. oscillatory circuits, **74**
Schröder, H., statistics of propagation in 5-m waveband, **2319**
Schröter, F., electron-beam switches, and applications, **1476**; quantized signals in communication technique, **3545**
Schrott, R., sounding equipment for ionosphere research, **405**
Schulkin, M., average radio-ray refraction in lower atmosphere, **2576**
Schultz, H. L., and W. G. Wadey, Yale linear electron accelerator, **220**
Schultz, L. N., radio communications in Australian flying-doctor service, **1727**
Schulz, H., transformation of quadripole-network matrix to diagonal form, **68**
Schumacher, B., characteristics of glow lamps in voltage-stabilizing circuits, **506**
Schumann, W. O., e.m. waves and plasma, **383**, **662**, **971**
Schwab, H., algebra of chains of contacts, **2128**
Schwartz, E., dot-interlaced scanning, **278**; build-up curve and bandwidth utilization in television, **3573**
Schwartz, L. S., basic communication theory, **3224**
—— and N. P. Salz, analysis of non-recurrent pulse groups, **1721**
Schwartz, S. A., stroboscopic earth-inductor compass, **1621**
Schwarz, E., photoconductive CdSe cells, **1148**, **1149**
Schwarz, K., mechanism of magnetic-tape recording, **2109**
Schwarz, K. M., overseas reception on medium waves, **256**
Schweisthal, A., cage-type broadcasting aerial feeder, **2431**; experience with double-feed medium-wave aerials, **2439**; twin drive as active reserve for broadcasting transmitters, **2645**
—— with others, Ravensburg 2 × 20-kW broadcasting transmitter, **2644**
Schwenn, W., with others, Type-48 line amplifier for programme transmission, **1238**
Schwetzoff, V., S. Robin and B. Vodar, electron multiplier for ultraviolet range down to 1450 Å, **2360**; characteristics of photomultiplier using Cu-Be alloy, **3594**
—— with others, applications of ultraviolet absorption in vacuum technique, **419**
Schwindenhammer, M., with P. Rivère, equipment of Dijon-Strasbourg radio beam link, **2613**
Schwinger, J., with H. Levine, diffraction of e.m. wave by aperture in infinite plane conducting screen, **1583**
Scott, G. D., with C. E. Ells, structure of sputtered Ag films, **2239**
Scott, R. E., network synthesis by use of potential analogues, **3024**
Scott, R. F., remote-control equipment for television receivers, **1760**
Scott, T. R., crystal triodes, **1157**
Scott-Farnie, G. R., and M. I. Forsyth-Grant, future developments in aeradio, **2037**
Scott-Taggart, J., standardization of technical terms and circuit presentation, **2098**
Scroggie, M. G., valve voltmeter, without calibration drift, **1041**, **1376**, rectifier section of, **1671**
Scullin, C. E., with H. J. Dailey, application of valves in h.f. heating equipment, **757**
Seddig, M., and G. Haase, measurement of pressures $< 10^{-7}$ mm Hg by adsorption manometer, **2529**
Seeliger, R., spherical-aberration correction of electron lenses, **763**
Seely, S., with J. Millman, Electronics, **(B)1086**
Segal, S. M., with W. Finkelnburg, potential field of gas discharge, **108**
Seigle, R. K., television streaking test set, **1043**
Seiler, K., temperature dependence of crystal-rectifier characteristics, **1645**
Seitz, F., with D. L. Dexter, effect of dislocations on mobilities in semiconductors, **3448**
Selényi, P., effect of bending on Se-rectifier disks, **2622**; effect of Hg vapour on Se rectifiers and photocells, **3474**
Selgin, P. J., revised method of filter design, **1862**
Selig, K. L., with G. L. Ashdown, general-purpose differential analyser, **1069**
Sels, J., and J. Iltis, measurement of group propagation time differences on a non-looped line, **1373**
—— with others, sonic and ultrasonic noise in engineering and aviation, **2102**
Sen, H. K., with J. Feinstein, radio wave generation by multistream interaction, **104**
Senior, T. B. A., diffraction by semi-infinite metal sheet, **3418**
Seppen, J. M. G., aerial measurements in microwave range, **2446**
Septier, A., with others, ion image of emissive anode, **1695**
Seulen, G. W., m.f. induction heating in drop-forging industry, **1692**
Severin, H., generation of oscillations at cm λ, **2946**
Seymour, J. W., project 'Vagabond', **3557**
Shah, J. R., and L. Jacob, field distribution in symmetrical e.s. electron lens, **1396**
Shain, C. A., galactic radiation at 18·3 Mc/s, **980**
Shannon, C. E., prediction and entropy of printed English, **1424**
Shapiro, G., with others, new techniques for electronic miniaturization, **2754**
Sharpless, W. M., measurements on artificial dielectrics, **727**
Shaw, I. J., ionospheric cross-modulation, **785**; Fourier analysis and negative frequencies, **1422**
Shaw, R., with R. D. Kodis, crack detector for gun barrels, **454**
Shaw, R. F., with others, Binac digital computor, **1356**
Shea, R. F., transistor power amplifiers, **3388**
Shears, P. A., recording-studio design, **568**
Shelley, B. J., crystal-transducer response curves, **890**
Shelton, G. R., with others, properties of $Be/BaTiO_3$ dielectrics, **706**
Shepard, B. R., high-speed sampling techniques, **64**
Shepherd, W. G., with W. F. Leverton, radioactive isotopes in study of cathode evaporation, **3601**
Sheppard, G. E., M. Garbuny and J. R. Hansen, reflex resnatron for u.h.f. television, **3617**
Shibayama, K., with T. Nimura, radiation impedance of ribbon-type sound sources, **3301**; diaphragm resonance in cone-type loudspeakers, **3325**, **3327**
Shibuya, M., with others, a.c. characteristics of Si *p-n* junctions, **1323**
Shields, J. P., new sound-recording system, **2702**
Shimazu, J., emission and crystal size of oxide cathodes, **2379**
Shimizu, H., with Y. Kikuchi, hysteresis losses in magnetostriction oscillators, **303**; attenuation of electroacoustic transducers for case of conjugate matching, **3305**; attenuation of ring-type magnetostriction transducer, **3306**
Shimmins, A. J., operation of cathode follower with capacitive load, **2481**
Shimoda, K., mode-conversion losses in cavity resonator with tilted end-plate, **1866**
Shindo, T., space-charge effect in oxide-cathode layer, **2082**
Shinn, D. H., and H. A. Whale, group velocities and group heights from magneto-ionic theory, **1405**, **(C)2009**
Shipton, H. W., with W. Grey Walter, toposcopic display system for neurophysiology, **753**
Shirobokov, M. Ya., and L. P. Kholodenko, thermodynamic theory of ferroelectric properties of $BaTiO_3$-type materials, **3444**
—— with L. P. Kholodenko, ferroelectric properties of $BaTiO_3$-type crystals under elastic stress, **3445**
Shmoys, J., virtual-height calculation for specific ionospheric distributions, **2507**; reflection coefficient of exponential layer, **(D)2508**
Shockley, W., electron mobility in Ge and Ohm's law, **1011**
—— with others, Ge *p-n* junctions, Zener current in, **164**, probing space-charge layer in, **2526**; measurement of diffusion in Ge by capacitance method, **2821**
Shorter, D. E. L., and D. G. Beadle, portable microphone amplifier with miniature valves, **946**
—— and W. Wharton, portable 7·5-W loudspeaker amplifier, **2171**
Shrader, E. F., with R. I. Strough, pulsed air-core generator for producing strong magnetic fields, **759**
Shul'man, M. S., with others, dielectric properties of TiO_2, **1345**
Shultz, E. L., with others, probability distribution of phase of resultant of constant vector and one with Rayleigh distribution, **2251**
Shumard, C. C., with A. W. Vance, 4000-valve computer, regulated power supplies for, **1436**, regulated 1600-A filament supply for, **1741**
Shvarts, A. A., calculation of skin effect in sheet permalloy, **3119**
Sichak, W., and H. Augenblick, tunable waveguide filters, **353**, **1834**
Siday, R. E., with W. Ehrenberg, refractive index in electron optics, **(D)1998**
Siedentopf, H., with A. Behr, review of solar observations, **2309**
Siegert, A. J. F., evaluation of noise samples, **3542**
Siegert, R., distortion and power output of negative-feedback class-A amplifier valves, **95**; transportable u.s.w. directional-link equipment, **2032**
Siksna, R., with N. Norinder, variations of ion concentration near ground, **410**, **1606**
Silberstein, R., interpretation of c.w. field-intensity records with aid of pulse data, **3219**
Sillars, R. W., industrial applications of SiC resistors, **2787**
da Silveira, A., analytical expression of Huyghens' principle for e.m. waves, **1584**
Silver, M., with B. Bederson, nonelectronic rectangular-wave generator, **2479**
Simmons, A. J., errors in microwave rotary phase shifter, **2711**; compact wide-band microwave λ/4 plate, **3348**
—— with others, microwave-aerial ferrite applications, **2721**
Simon, A., V_a/V_g characteristics of amplifier circuits, **2168**; theory of Doherty power amplifier, **3390**
Simon, J. C., u.h.f. lens aerial, diffraction by plane screens and application to, **970**, new type of, **2443**
Simons, J. C., and J. C. Slater, resonance effects for confocal spheroidal cavity system, **2160**
Simpson, L. C., H. J. B. Nevitt and E. J. Eriksen, v.h.f. multichannel carrier-telephony circuits in Colombia, **1430**
Simpson, O., infrared photoconductivity, mechanism in PbTe, **861**
—— and G. B. B. M. Sutherland, infrared photoconductivity of PbTe films, **860**
Sims, D., with T. Miller, high-resolution spectrum analyser, **1050**
Sinclair, B. H., miniature transponder beacon for guided missiles, **2225**
Sinclair, D. B., with A. Peterson, single-end push-pull a.f. amplifier, **1250**
Sing, Chang. See Chang Sing.
Singer, R., practical assembly of printed circuits, **629**
Sinton, W. M., detection of mm-λ solar radiation, **3076**
Sittner, W. R., current multiplication in type-A transistor, **2366**
Sivaramakrishnan, M. V., geomagnetic field variations at Kodaikanal, [illegible]
Six, W., applications of ferroxcube, **3124**
Sixtus, K., ferrite magnetostrictive oscillators, **1801**
Skalicky, M., theory of quadripoles, **3030**
Skolnik, S., with others, factors influencing dielectric properties of $BaTiO_3$ ceramics, **2244**
Skudrzyk, E., construction of high-power ultrasonic generators, **4**
Slade, B. N., improving stability of point-contact transistors, **2652**
Slade, J. J., Jr, and S. Weissmann, structure imperfections in multicrystal low-carbon alloy and Si ferrite, **2533**
Slate, M. W., J. P. Van Duyne and E. F. Mannerberg, modified-butterfly u.h.f.-television converter, **524**
Slater, J. C., with L. C. Maier, Jr, field-strength measurements, in linear-accelerator cavity, **2264**, in resonant cavities, **2265**
—— with J. C. Simons, resonance effects for confocal spheroidal cavity system, **2160**
—— with J. R. Terrall, particle dynamics in linear electron accelerator, **2296**
—— with others, M.I.T. linear electron accelerator, **2295**
Sleeper, M. B., WMIT high-power f.m. aerial, **1207**
Slichter, L. B., e.m. interpretation problem in geophysics, **1595**
Slonczewski, T., servo drive for heterodyne oscillators, **(A)720**
van Slooten, J., synchronization of LC oscillators, **1868**
Slusser, E. A., fringe-area performance predictions, **1457**
Smart, J. S., molecular-field treatment of ferromagnetism and antiferromagnetism, **3413**
Smith, A. W., and J. Turkevich, electron traps in ZnS phosphor, **3440**
Smith, C. H., Jr, with others, c.r.o. for recording rapid transients, **1978**
Smith, C. P., analysis and automatic recognition of speech sounds, **2971**
Smith, E. J., steady-state performance of self-saturating magnetic amplifiers, **3016**
Smith, F. G., four radio stars, positions of, **978**, annual parallax of, **1963**
—— with K. E. Machin, radio method for measuring electron density in solar corona, **1281**
—— with others, radio stars in northern hemisphere, **121**
Smith, F. W., network representation of amplifier admittances, **(C)641**; service-area charts for v.h.f. and u.h.f. television, **3263**
Smith, H. B., A. L. Olson and R. F. Cotellessa, colour-television system for industry, **(A)276**
Smith, H. W., with F. E. Brooks, Jr, computer for correlation functions, **2547**
Smith, J. R. W., with A. B. McFarlane, mathematical analysis of equivalent scanning circuit, **1441**
Smith, J. W., with J. V. L. Hogan, broadcast facsimile, **512**
Smith, K. O., with R. W. Friis, repeater equipment for TD-2 relay system, **1110**
—— with others, TD-2 relay system, **1109**
Smith, P. B., with others, effect of heat treatment on magnetic viscosity of permanent-magnet alloys, **3463**
Smith, P. T., u.h.f. powe triodes and tetrodes, **3286**
Smith, R., r.f. heating in industry, **755**
Smith, R. A., advantages of coherent and incoherent detectors, **(A)255**, **795**
—— with others, resonance in gyro-interaction of radio waves, **3214**
Smith, R. W., photoconductivity of CdS and CdSe, **1007**
Smith, S. E., and W. J. Kessler, cathode followers in series for high impedance-transformation ratios, **945**
—— with W. J. Kessler, expressions for reduction of distortion and output impedance in terms of db of feedback, **1566**
Smith, S. T., c.r. monoscope for simulation of radar directivity pattern, [illegible]
—— R. V. Talbot and C. H. Smith, Jr, c.r.o. for recording rapid transients, **1978**
Smith-Rose, R. L., 50th anniversary of transatlantic radio communication, **2023**; progress in colour television, **2906**
Smolczyk, H. G., with J. E. Hiller, Sb content and photoelectric effect of different samples of galena, **3106**
Smolenski, G. A., electrostriction in ferroelectric ceramics, **2819**
—— and N. V. Kozhevnikova, origin of ferroelectricity, **155**
Smoluchowski, R., with W. J. Carr magnetostriction of single crystals of Fe/Si alloys, **1012**
Smullin, L. D., and W. G. Glass, offset waveguide junction as reactive element, **910**
Smyth, J. B., and C. P. Hubbard, attenuation of radio signals caused by scattering, **(D)1716**
Snyder, W., and R. A. Helliwell, wave polarization chart for magneto-ionic theory, **2572**
Soanes, S. V., a.f. spectrum analysis, **3171**
Soderman, R. A., impedance measurements at 0·05–2 kMc/s, **445**
Sokolov, A. V., and A. Z. Veksler, thermionic emission from ferromagnetic materials, **3070**
Sokol'skaya, I. L., with I. I. Adrianiva, rectifying properties of PbS, **1343**
Soldi, M., thermistors as r.f. variable-resistance standards, **2134**
Sollfrey, W., wave propagation on helical wires, **660**
Sollima, M., modern radar landing systems, **145**
Solomon, S. S., thermal and shot fluctuations in conductors and valves, **2174**
Solow, M., with F. M. Greene, development of v.h.f. field-strength standards, **(A)2553**
Somerville, M. J., electronic multiplier for computer, **1652**
Somerville, T., and H. R. Humphreys, orchestral-studio design, **1508**
—— and F. L. Ward, investigation of sound diffusion in rooms, **14**
Sommers, H. S., Jr, P. R. Weiss and W. Halpern, magnet current stabilizer, **760**
Somos, I., characteristics of Se rectifiers, **3242**
Sondheimer, E. H., mean free path of electrons in metals, **2190**
Sorg, E., precision bridge for inductance and capacitance, **206**
Sowter, G. A. V., soft magnetic materials used in instrument manufacture, **1942**
Spandöck, F., wind noise and sound transmission in open air, **1**
Sparks, M., with others, Zener current in Ge *p-n* junctions, **164**; measurement of diffusion in Ge by capacitance method, **2821**; single-crystal Ge, **3135**
Spencer, D. E., with P. Moon, separability conditions for Laplace and Helmholtz equations, **3482**
Spencer, J. G., design for f.m. receiver, **1093**, **2589**
—— with others, proposed test procedure for f.m. receivers, **1984**
Spencer, R. E., detection of pulse signals near noise threshold, **1307**
Spengler, W., and H. H. Rust, simultaneous generation of audio frequencies by multi-electrode valve, **3044**
Spitzer, F., synthetic piezoelectric crystals, **1933**
Spooner, A. M., and F. W. Nicholls, linear 'staircase' generator for television use, **1684**
Spork, A., spectral representation of space-wave reception, **780**
Spradlin, J. D., R.C.A. colour-television camera chain, **2908**
Sprenger, K., with E. A. Lauter, nocturnal ionization disturbances in lower ionosphere, **3426**
Sproull, R. L., and others, growth and manipulation of BaO crystals, **174**
—— with R. S. Bever, dielectric constant of BaO, **157**
—— with W. W. Tyler, optical absorption and photoconductivity in BaO, **148**
Squires, J., with others, developments in electronic magnetometers, **1657**
Squires, W. K., and R. A. Goundry, constant-input-impedance television second detector, **2059**
Srivastava, K. G., simple method for measurement of piezoelectric constants, **2844**
Stahl, H. A., poisoning of oxide cathodes by atmospheric S, **2061**
Stallibrass, G. W., radio aids to air navigation and air traffic control, **2223**
Stanesby, H., with others, London-Birmingham television-cable system, **2625**
Stanner, W., radio d.f., **138**; Leitfaden der Funkortung, **(B)2816**
Stansfield, R., with E. S. L. Beale, Standard-Sunbury engine indicator Mark 6, **754**
Stanworth, J. E., tellurite glasses, **2834**
Starks-Field, A. B., 'flywheel' synchronizing circuit for television-receiver timebases, **525**
Starr, A. T., G. King and L. Lewin, 1-MeV linear electron accelerator, **1068**
Statt, C. J., with M. H. Diehl, frequency adjustment of mobile transmitters, **1084**
Staver, T., with D. Bohm, application of collective treatment of electron vibrations to theory of conductivity, **1576**
Steckelmacher, W., Knudsen vacuum gauges, **3101**
Steen, J. R., J.E.T.E.C. approach to valve-reliability problem, **863**
Steidle, W. E., requirements for direction finders, **2516**
Steinberg, B. D., correlation functions of variable networks, **1229**
Steinberg, J. L., with others, observation of solar eclipse, 1st Sept. 1951, **1282**; ellipsoidal form of sun at metre wavelengths, **2786**
Steinbuch, K., pulse distortion in RC and LG lines, **578**
Steiner, F., h.f. matching transformer, **616**
Steingroever, E., magnet-steel test unit with compensated fluxmeter, **2275**
Stelmak, J. P., electric forming in *n*-type Ge transistors, **296**
Stenzel, H., radiation field of two radiators, **1281**; directivity index for acoustic radiators, **(D)3302**
Stepp, W., European broadcasting conference, Stockholm, 1952, **3560**
Stern, J. C., with — Déribéré, electronic control of soldering temperatures using infrared radiation, **772**
Sterner, J. F., with J. A. Cornell, sweep-frequency generator for u.h.f. television band, **2285**
Stevels, J. M., dielectric losses in glass, **3476**
Stevenson, A. F., horns, acoustic, equations for wave propagation in, **1798**, e.m., general theory of, **1841**, **(C)3005**
Stewart, E. S., with J. L. Stewart, recording ultrasonic interferometer, **1809**
Stewart, J. L., general theory for frequency discriminators including null networks, **1416**
—— and E. S. Stewart, recording ultrasonic interferometer, **1809**
Stibbe, H., RC tuned oscillators, **(D)3381**
Stieltjes, F. H., with P. J. W. Jochems, apparatus for testing transistors, **2556**
Stjernberg, B. K. E., with others, microwave propagation in optical range, **789**
Stöckmann, F., radiationless electron transitions in crystals, **1260**; physics of crystal phosphors, **3654**
—— with K. Intemann, measurements of Hall effect in ZnO, **2825**
Stöhr, W., with H. Körner, wide-band aerial for u.s.w. beam links, **3254**
Stone, W. R., with others, test-pattern generator for colour television, **619**
Storch, L., theory of multisection RC filter network, **623**
Storer, J. E., aerial over large conducting screen, impedance of, **596**, radiation pattern of, **3066**
—— and R. King, radiation resistance of 2-wire line, **577**
Storm, B., solution of Hallén's integral equation for cylindrical aerial, **2715**
Storm, H. F., series-connected saturable reactor with high-impedance control source, **3615**

Stoudenheimer, R. G., with others, production testing of multiplier phototubes, **3271**
Stoyko, N., variations of the earth's magnetic field and rotation, **126**
Strafford, F. R. W., television receiving aerials, **2440**
Straker, T. W., with others, ionospheric propagation of 16-kc/s waves over distances of about 540 km, **2871**
Strandberg, M. W. P., with H. R. Johnson, beam system for reduction of Doppler broadening of microwave absorption line, **2207**
Stranz, D., 1949 fade-out statistics, **1087**
Strashkevich, A. M., with others, electron-optical systems with apertures deviating from ideal, **1076**
Stratman, H. G., f.m. transmitter for 42 Mc/s, **3265**
Stratton, K., and F. C. Champion, counting response of two large diamonds under β-irradiation, **3527**
Straumanis, M. E., and E. Z. Aka, lattice parameters, expansion coefficients, and atomic weights of purest Si and Ge, **2541**
Strecker, F., Praktische Stabilitätsprüfung mittels Ortskurven und numerischer Verfahren, **(B)372**
Street, R., J. C. Woolley and P. B. Smith, effect of heat treatment on magnetic viscosity of permanent-magnet alloys, **3463**
Strohhacker, M., with others, Telegon direction finder, **139**
Stroobants, P., optimum number of scanning lines, **3245**
Strough, R. I., and E. F. Shrader, pulsed air-core generator for producing strong magnetic fields, **759**
Strutt, M. J. O., Verstärker und Empfänger, **(B)955**; efficiency of thermal electron emission, **2650**
Stuart, R. D., with K. Weekes, ionospheric propagation at about 100 kc/s, over short distances, **(A)2577, 3533,** over distances up to 1000 km, **(A)2578, 3534**
Studer, F. J., D. A. Cusano and A. H. Young, transparent luminescent films, **685**
—— with G. R. Fonda, optical properties of $CaSiO_3$ phosphors, **3109**
Stuke, J., new photocells, **540**
Sturley, K. R., television waveform display, **447, 741**
Sturrock, P. A., formulae for third-order aberrations in e.s. lenses, **460;** magnetic electron lenses, aberrations due to asymmetries, **1074,** third-order, **228;** perturbation characteristic functions and application in electron optics, **1997**
Sturtevant, J. M., millisecond timer, **214**
Stürzinger, O., tabulated data on crystal valves, **2395**
Styles, R. S., simplified airborne multitrack range equipment, **1618**
Sucher, M., with H. J. Carlin, accuracy of bolometric power measurements, **3511**
Suchet, J., with N'Guyen Thien-Chi, thermistors, refractory, **165,** temperature compensation of precision measurement apparatus by, **199,** temperature regulation by, **2291;** nonlinear resistors, with sintered-carborundum base, **1219,** with sintered-semiconductor base, **3364;** conductivity of semiconductors and thermistors, **1845**
van Suchtelen, H., with others, Electronic Valves, Book V—Application of the Electronic Valve in Radio Receivers and Amplifiers, Vol. 2—A.F. Amplification, the Output Stage, Power Supply, [illegible]
Sueur, R., evolution of long-distance lines, **490;** modern systems of long-distance communication, **2593**
—— and L. J. Libois, radio beam links in telephone networks, **2611**
Suhl, H., and L. R. Walker, Faraday rotation of guided waves, **2710**
—— with G. L. Pearson, magnetoresistance of oriented Ge single crystals, [illegible]
Sullivan, J. V., with A. L. Reimann, rectification phenomena with natural and sulphurized galena, **3473**
Sulzer, P. G., locked-oscillator frequency dividers, **944;** selective RC bridge, **1976**
—— and E. E. Ferguson, sweep-frequency oblique-incidence measurements over 1150-km path, **3530**
—— G. F. Montgomery and I. H. Gerks, u.h.f. moon relay, **2008**
Summerhayes, H. R., Jr, with E. D. Cook, supervisory instrument for broadcast stations, **807**
Summerlin, F. A., compensation of zero-drift errors in direct-coupled feedback systems, **(D)1252**
Sundaram, P. M., electrical constants of soil at u.h.f., **2498**
Sunde, A., with G. Jenssen, pulse-height analyser for time-interval measurements, **3157**
Suppan, M., Italcable radio transmitting station at Torrenova, **1433**
Surdin, M., resistance fluctuations, and flicker effect, **1253,** in semiconductors, **1325**
—— with others, radio link for studying coincidences between pulses, **1731**
Surtees, W. J., mutual coupling of slot and dipole aerial, **1835**
Süsskind, C., obstacle-type artificial dielectrics for microwaves, **2123**
—— and A. R. Perrins, c.r.o. plotter for microwave fields, **448**
Sutcliffe, H., image impedance of active linear quadriople, **2458**
Sutherland, G. B. B. M., with O. Simpson, infrared photoconductivity of PbTe films, **860**
Sutter, W. E., with R. V. Rector, microwave systems for 960 Mc/s and 2 kMc/s, **3229**
Svensson, N. L., theory of stresses in glass butt seals, **(D)2249**
Sveshnikov, A. G., principle of limiting absorption in waveguides, **3344**
Swenson, G. W., Jr, and T. J. Higgins, d.c. network analyser for wave-equation boundary-value problems, **2254**
Swets, B., with A. G. Robeer, 40-kW broadcasting transmitter, **1461**
Sykes, A. O., with others, reciprocity calibration of piezoelectric accelerometers, **3516**
Synge, J. L., fundamental theorem of electrical networks, **347;** relativistic relations between frequency, λ, and phase and group velocities, [illegible]
Szegho, C. S., c.r. picture tube with low focusing voltage, **3259**
—— and R. G. Pohl, television picture tubes with iron envelopes, **1790**
Székely, A., h.f. conductivity of ionized air, **382**

T

Ta-You Wu. See Wu, Ta-You.
Taeger, W., oscillations in circuit with periodically varying capacitance, **76;** h.f. effective resistance and inductance of conductor, **575;** transformer properties of choke filters, **1234;** switching phenomena in circuits including valves, **2738**
Taft, E. A., and M. H. Hebb, quenching of photoconductivity in CdS, **3105**
Taieb, J., reduction of measuring time of low-current amplifiers, **1364**
Takagi, E., with others, equation of thermionic emission of oxide-coated cathode, **2063;** vibrating-capacitor electrometer, **3500**
Talbot, R. V., with others, c.r.o. for recording rapid transients, **1978**
Tal'yanski, I. I., with A. E. Glauberman, electron emission from metal in electric field, **1467**
Tanner, J. A., minimum-phase networks, **1536;** logarithmic plotting technique for design of closed-loop control systems, **2039**
—— and B. G. V. Harrington, frequency-compensated direct-coupled amplifier for 4-channel pen recorder, **(D)1878**
Taplin, R. H., with others, counting system for nucleonics, **610**
Taraboletti, A., frequency multiplier with selective grid circuit, **84**
Tarnóczy, T. H., acoustical investigations in municipal theatre, Budapest, **2104**
Tarpley, R. E., with others, d.c. amplifier with reduced-zero-offset, **93**
Taylor, C. A., applied electronics, **758;** electronics exhibition, Manchester, 1952, **3623**
Taylor, D., radiation and particle detectors in nucleonic instruments, **765**
—— and W. Abson, radiation-measurement instruments for X rays to cosmic rays, **1989**
Taylor, D. P., application of telecommunications to civil airways, **3096**
Taylor, J. C., with H. D. M. Ellis, design of automatic sequential monitoring equipment, **2034**
Taylor, J. H., with P. H. Parkin, speech reinforcement in St. Paul's cathedral, **1508**
Taylor, W. K., with C. N. W. Litting, automatically controlled Knudsen-type vacuum gauge, **2817**
Tchernicheff, A., measurements on rounded-signal R/T transmitter, **762**
Teal, G. K., M. Sparks and E. Buehler, single-crystal Ge, **3135**
—— with others, elastic constants of Si single crystals, **1014**
Teasdale, R. D., with R. A. Martin, input-admittance characteristics of tuned coupled circuits, **1241, (C)2157**
Teegan, J. A., radio research at Cambridge University, **880;** research in s.w. absorption spectroscopy at Oxford University, **2957**
Teichmann, T., completeness relations for loss-free microwave junctions, [illegible]
Telcs, M. L., Fourier analysis and negative frequencies, **(D)1720**
Tellez Plasencia, H., measurement of very high resistance and low capacitance, **728**
Templeton, J., high-stability h.v. power supply, **1743**
Tennes, C. J., with S. L. Krauss, electronic-organ tone generators, **905**
Terrall, J. R., and J. C. Slater, particle dynamics in linear electron accelerator, **2296**
Tessman, J. R., Lorentz correction in hexagonal $BaTiO_3$, **173**
Thain, R. S., with R. C. Langille, measurement of 3-cm radar echoes from falling snow, **1613**
Theile, R., and H. McGhee, negative feedback in flying-spot scanners, **3255**
—— and F. H. Townsend, pulsed biasing of storage surface in image iconoscopes, **2055**
—— with J. E. Cope, impedance changes in image iconoscopes, **521**
—— with others, improvements in image-iconoscope-type tubes, **2632**
Theissen, E., with others, field strength of waves reflected by ionosphere, **2318**
Theuerer, H. C., with others, thermally produced acceptors in Ge, **2235**
Thien-Chi N'Guyen. See N'Guyen, Thien-Chi.
Thiessen, G., measurements of sun's general magnetic field, **2210**
Thomas, A. B., 'velocity-modulation' in television-image reproduction, **(D)823**
—— with B. Y. Mills, source of r.f. radiation in Cygnus, **120**
Thomas, C. H., with others, impulse measurements with repeated-structure networks, **2267**
Thomas, G. E., with others, magnetic store for universal high-speed digital computer, **2840**
Thomas, H. A., Theory and Design of Valve Oscillators, **(B)1255**
Thomas, H. E., wide-angle deflection yokes, **1757**
Thomas, L. A., and W. A. Wooster, piezocrescence, **705**
Thomas, P. A. V., with A. M. Hardie, slow-speed circular timebase, **2755**
Thompson, H., Maxwell's reciprocity law and Thévenin's theorem in passive-quadripole analysis, **1858**
Thompson, L. D. G., with A. D. Misener, pressure coefficient of resistance of thermistors, **3018**
Thomson, W. E., networks with maximally flat delay, **3375**
Thonemann, P. C., W. T. Cowhig and P. A. Davenport, interaction of travelling magnetic fields with ionized gases, **2195**
—— with others, dielectric constant and electron density in gas discharge, **651**
Thouzéry, J., tensor analysis of network impedance, **1859**
Thring, M. W., British instrument industries exhibition, London, 1951, **1794**
Thurston, E. G., with others, design of optimum directive acoustic arrays, **1799**
Thurston, J. N., electronically controlled resistors, **1851**
Thwaites, J. E., a.f. quartz vibrators, **(A)2472, 3378**
Tiberio, U., echo and noise in radar system subjected to deliberate interference, **3090**
Tien, Ping King, and L. M. Field, space-charge waves in accelerated electron stream for microwave amplification, **2866**
Tigler, H., comparison of d.c./a.c. converters, **504, (C)1119**
Tillman, J. R., transition in Eccles-Jordan circuit, **62;** space-current changes in oxide-cathode valves following small current pulse, **2078**
Tilton, W. D., Jr, 6-channel recording c.r.o., **1048**
Tischer, F., inductive probe for microwave measurements, **1958**
Tischer, F. J., effective bandwidth of video amplifiers, **3050, 3385**
Tolpadi, S. K. R., with others, volume rectification in zincite, **158**
Tolpygo, K. B., with M. A. Krivoglaz, contact resistance and contact potential difference, **2194**
Tombs, D. M., with P. Bura, resonant circuit with periodically varying parameters, **2471, (D)2756**
Tomovic, R., with others, new construction principle for analogue computers, **2256**
Tomura, M., creep phenomena of Se rectifiers, **2044**
Toppinga, M. L., design of cavity-resonator wavemeters for cm waves, **744**
Torizuka, Y., with others, ferromagnetic resonance in Co ferrite at high temperature, **1327**
Tortosa, J., with M. Perrot, conductivity of Si films, **3451**
Toulon, P., television application of surfaces with multiple planes of polarization, **3578**
Tousey, R., K. Watanabe and J. D. Purcell, measurements in rockets of solar ultraviolet radiation, **115**
—— with others, atmospheric ozone distribution to 70 km height, **2794**
Townes, C. H., 'atomic' clocks and frequency stabilization by means of microwave spectral lines, **1659**
—— with others, magnetron harmonics at mm λ, **2478**
Townsend, F. H., with R. Theile, pulsed biasing of storage surface in image ionoscopes, **2055**
Tozzi, R., with S. Giustini, measurement of high power at microwave frequencies, **3185**
Trambarulo, R., with others, microwave spectroscopy at 2–3-mm λ, **1896**
Tranter, C. J., Integral Transforms in Mathematical Physics, **(B)435**
Trendelenburg, F., acoustics of organs, **886**
Troitski, V. S., theory of measurement of weak signals with continuous spectrum, **2885**
Troost, A., developments in s.w. Adcock direction finders, **2519**
—— and R. Jankovsky, recent goniometer developments, **140**
—— with others, Telegon direction finder, **139**
Trott, N. G., toroidal Geiger counters, **2571**
Trudse, E., with J. Hartmann, synchronization of air-jet generators, **299**
True, V., automatic impedance matcher, **1224**
Truell, J., with R. L. Roderick, measurement of ultrasonic attenuation in solids by pulse technique, **2099**
Truell, R., with S. Levy, effect of magnetization on ultrasonic attenuation in Ni and Fe-Si single crystals, **169**
Trump, J. G., e.s. accelerator as source of ionizing energy, **1069**
Tsukkerman, I. I., magnetic electron-optical system analogous to plano-concave lens, **1395**
Tucker, D. G., modulators etc. using frequency-dependent rectifiers, **282;** linear rectifiers and limiters, **2588;** resonant circuit with periodically varying parameters, **(D)2756;** synchrodyne and coherent detectors, **2883**
Tupper, B. R., and P. B. Patton, multichannel telephony on v.h.f. radio links, **3233**
Turkevich, J., with A. W. Smith, electron traps in ZnS phosphor, **3440**
Turner, G. S., F.C.C. plan for handling television interference, **2358**
Turner, L. B., two electronic resistance or conductance meters, **2853**
Turner, R. J., reflectionless joints for coaxial-pair cables, **3337**
Turncock, R. C., image-converters as high-speed shutters, **1400**
Tuska, C. D., pictorial radio, **2219**
Tustin, A., automatic control, **1061**
Tusting, W., television oscilloscope, **2559**
Tutino, C., and G. Sacerdote, broadcasting studios with sound-diffusing walls, **569**
Twersky, V., multiple scattering of radiation by parallel cylinders, **1803, 2685**
Twiss, R. Q., oscillations in electron streams, **654;** Bailey's theory of amplified waves in ionized medium, **1593;** excess radio noise from solar flares and sunspots, **2212**
Tyler, W. W., and R. L. Sproull, optical absorption and photoconductivity in BaO, **148**
—— with others, growth and manipulation of BaO crystals, **174**
Tyson, B. F., u.h.f. television converter, **1454**
—— and J. G. Weissman, r.f. amplifier for u.h.f. television tuner, **370**
—— with R. M. Bowie, N.T.S.C., colour-television transmission system, **2343**

U

Uchida, H., attenuation of spurious emission of v.h.f. transmitter, **3497**
Uda, S., and J. Ikeuchi, klystrons, effects of grid mesh on performance of, **878,** equivalent networks of, **1481**
—— and Y. Mushiake, aerials, parallel, calculation of input impedances of, **396,** with thickness discontinuities, theory of, **1203,** slot, input impedance of, **1839**
Ukrow, H., Montavox equipment for h.f. telephony in mining, **3549**
Ulbricht, G., IDA 22 beam-link equipment, **1432**
Unger, H. G., experimental investigation of theory of retarding-field valve, **2949**
Upham, J. L., Jr, self-tracking detector for a.f. bridges, **1042**
Urban, P., with E. Ledinegg, natural oscillations of cylindrical resonators with stratified dielectric, **1242;** results from theory of coupled cavity resonators, **1550;** determination of loss angle of materials with high dielectric constant, **1666;** completeness of system of E- and H-type waves in waveguides, **2433**
—— with others, measurement of dielectric constant of fluids at cm λ, **1664**
Usdin, E., with M. Golomb, theory of multidimensional servo systems, **2338**
Uzan, R., optical emissivity and thermionic emission of ceria, **2196**
—— with G. Mesnard, electrical properties of thoria, **869**

V

Vail, C. L., Circuits in Electrical Engineering, **(B)1568**
Vainshtein, L. A., asymmetrical waves in circular waveguide with open end, **318, 319**
Valdes, L. B., collector-forming effects in *n*-type Ge transistors, **2367**
Valentini, N., design of channel filters using crystals, **3033**
Valeton, J. J. P., with others, interference effects on television pictures, **2441**
Vallauri, G., electromagnetic and magnetoelectric induction, **2204**
Vallauri, M., with P. Lombardi, experiments on Italian thermistors, **58**
Vallée, R., 'observation operators', two classes of, **1570,** and information theory, **1898;** information aspect of uncertainty relations, **1897**
Vance, A. W., and C. C. Shumard, 4000-valve computer, regulated power supplies for, **1436,** regulated 1600-A filament supply for, **1741**
Vander Sluis, K. L., with others, determination of velocity of light by band-spectrum method, **3053**
Van Duyne, J. P., with others, modified-butterfly u.h.f. television converter, **524**
Van Ormer, D. D., and D. C. Ballard, effects of screen tolerances on operating characteristics of aperture-mask tricolour kinescopes, **852**
—— with H. C. Moodey, 3-beam guns for colour kinescopes, **850**
Van Valkenburg, A., R. G. Pike, synthesis of mica, **3149**
Varian, R. H., recent developments in klystrons, **2090**
Varian Associates, Engineering Staff of, high-power u.h.f.-television klystron, **558**
Vasenin, F. I., with others, properties of blue TiO_2, **1344**
Vasil'ev, E. I., and V. M. Lopukhin, self-excitation of decelerating system (magnetron), **1480**
Vasseur, J. P., diffraction of e.m. waves by apertures in plane conducting screens, **2184**
Vassy, E., atmospheric sources of interference in navigation aids, **1308**
Vastel, J., experimental study of waveguide electron accelerator, **2294**
Vaughan, H. E., with W. A. Malthaner, experimental electronic automatic switching system, **2597**
Vaughan, J. F. O., radio feeder unit, **1091**
Vaughan, W. C., spectrum of f.m. wave, and Bessel functions, **2892, (C)3554**
Vaury, J. J., with R. Bureau, recording of atmospherics in *Commandant Charcot*, 1950–1951, **1305**
Veith, F. S., with others, performance of vidicon television camera tubes, **2914**
Veith, W., and G. Wlérick, effect of light on semiconductors, **1627**
Vekslor, A. Z., with A. V. Sokolov, thermionic emission from ferromagnetic materials, **3070**
van der Velden, H. A., with G. P. Freeman, counting properties of diamond, **1398,** differences in, **2004, 2308**
Veldkamp, J., with J. Bartels, international data on magnetic disturbances, first quarter 1951, **124,** second quarter 1951, **1286,** third quarter 1951, **2501,** fourth quarter 1951, **2792**
Velizhanina, K. A., experimental investigation of resonant sound absorbers, **2696**
Ventouratos, P. G., measurement of electrical constants of piezoelectric crystals, **722**
Venzke, G., comparative reverberation-room measurements of absorption coefficient, **2420**
Vermandé, J., calibration and use of Penning vacuum gauge, **3102**
Vernotte, P., analysis, of experimental curves, **373,** of experiments, correcting for uncertainty of data in, **1256**
Veronda, C., with V. Learned, high-power klystron amplifiers, **2393**
Ver Planck, D. W., L. A. Finzi and D. C. Beaumariage, analysis of transients in magnetic amplifiers, **2133**
Verstraten, J., transmitter and receiver of harbour radar at Ijmuiden, **3434**
Vervest, W. L., with A. G. Robeer, water jacket for large transmitting valves, **1473**
Verwey, E. J. W., and F. A. Kröger, oxidic semiconductors and ZnS phosphors, **1625**
Villard, L., influence of chandeliers on acoustics of halls, **1190**
Villard, O. G., Jr, tunable shunt selector-rejector for a.f. amplifiers, **1949;** cascade connection of 90°-phase-shift networks, **1861**
—— and A. M. Peterson, instantaneous prediction of radio transmission paths, **2579**
—— and W. L. Rorden, flexible selectivity for communication receivers, [illegible]
—— A. M. Peterson and L. A. Manning, studying sporadic-E clouds, [illegible]
Ville, J. A., entropy of a transmission system, **1098;** quarternion calculus and chain arrangements of quadripoles, **3374**
Vincelet, P. E., u.h.f. dipoles, **45**
Vincent, A. M., dielectric amplifier fundamentals, **1561**
Vincre, A., Brown Boveri s.w. transmitters for civil aviation service, **1768**
Vine, B. H., R. B. Janes and F. S. Veith, performance of vidicon television camera tubes, **2914**
Vink, H. J., with others, thermionic emitters under pulsed operation, **3600**
Vodar, B., with others, applications of ultraviolet absorption in vacuum technique, **419;** variation of resistance of metal films with applied potential, **2192;** electron multiplier for ultraviolet range down to 1450 Å, **2369;** characteristics of photomultiplier using Cu-Be alloy, **3594**
Vodden, C. C., with B. Eastwood, line-scanning valves and circuits, **2638**
Voelker, D., and G. Doetsch, Die zweidimensionale Laplace-Transformation, eine Einführung in ihre Anwendung zur Lösung von Randwertproblemen nebst Tabellen von Korrespondenzen, **(B)1360**
Voelz, K., damping of acoustic resonators, **2687**
Voge, J., Les Hyperfréquences (Tubes et appareils de mesure. Applications aux télécommunications et au radar), **(B)2406**
Vogel, T., sawtooth oscillations, **630**
Vogt, W., conversion of pulses of varying heights and constant width to pulses of constant height and varying widths, **1526**
Voigt, G., prism relay aerials for dm waves, **3003**
Voigt, H., with R. Walter, recording frequency comparator, **3172**
Volkov, D. I., magnetization of highly coercive ferromagnetic materials in weak fields, **3117**
Vollmer, H., measurement of pitch fluctuations, **2696**
Vonberg, D. D., with others, equipment for measuring small r.f. noise powers, **2560**
Vormer, J. J., crystal plates without overtones, **490**
de Vos, J., wide-band amplifiers with stagger-tuned circuits, **2176**
Vos de Wael, L. R. M., direct-reading frequency meter for 30 c/s–30 Mc/s, **743, 2855**
de Vrijer, F. W., with J. Haantjes, flicker in television pictures, **1128**

W

Wada, M., amplification factor, of planar triode, **552,** of cylindrical triode, **3607;** *I/V* characteristics of beam power valve, **3611**
—— with others, considerations on space-charge equation, **2561**
Wadey, W. G., with H. L. Schultz, Yale linear electron accelerator, **290**
Wagener, S., production of very high vacua by use of getters, **2521**
—— and C. B. Johnson, calibration of ionization gauges, **1004**

—— with G. Herrmann, The Oxide-Coated Cathode, Vol. 1, Manufacture, (B)2094, (B)2955, Vol. 2, Physics, (B)2956
—— with others, life of oxide cathodes in receiving valves, 1781
Wagenknecht, F., h.f. properties of ferrites, 690
Wagner, K. W., dielectric properties of insulating materials, 177
Wahl, R., pulse amplitude selectors, 1214
Waidelich, D. L., steady-state waves on transmission lines, 2989
Wait, C., thyratron rectifiers in broadcasting transmitters, 3569
Wait, G. R., measurements of electric current through thunderclouds, 414
Wait, J. R., magnetic dipole over horizontally stratified earth, 1585; transient e.m. wave propagation in conducting medium, 1586
Walcher, W., graphical method for determining electron paths in e.s. lenses, 462
—— with E. W. Becker, defects in mass spectrometer due to space charge and magnetic-field saturation, 2290
Wälchli, R., matching, efficiency and applications of h.f. heating, 756
Waldick, L., with W. Schmitz, power measurements on ultrasonic quartz oscillators, 734
Waldkötter, E., with others, reversible changes in Se rectifiers, 1642
Waldmeier, M., final relative sunspot numbers for 1950, 118; provisional sunspot numbers, April–June 1951, 119; July-Sept. 1951, 1280, Oct.–Dec. 1951, 2495, Jan.–March 1952, 2783
Walker, A. H. B., power pack with variable h.v., 3562
Walker, L. R., with H. Suhl, Faraday rotation of guided waves, 2710
Walker, P. J., with D. T. N. Williamson, amplifiers and superlatives, 3387
Wallace, P. R., theory of radiation from multipoles, 965
Wallace, R. L., Jr, reproduction of magnetically recorded signals, 889
Wallauschek, R., with P. Clostre, signal generator for measurements at u.h.f., 2862; travelling-wave valves Types M8 and M11, measurements and characteristics for, 2937, impedance matching to coaxial lines, 2939
Walley, J. W., with others, developments and simplifications in permeameters, 3499
Wallick, G. C., size effects in luminescence of ZnS phosphors, 1319
Wallmark, J. T., high-transconductance valve using space-charge deflection of beam, 1477; influence of initial velocities on electron transit times in diodes, 1783
Walsh, A. A., with others, N.B.C. New York colour-television field-test studio, 2909
Walsh, E. J., with G. T. Ford, new valves for a coaxial-cable transmission system, 1165
Walsh, J. E., radiation patterns of arrays with reflecting cylinder, 325
van der Walt, N. T., electronic servo simulator, 1689
Walter, R., theory of multiple-feed aerials, 2438
—— and H. Voigt, recording frequency comparator, 3172
Walter, W. Grey, and H. W. Shipton, toposcopic display system for neurophysiology, 753
Wang, An, miniature rectifier computing and controlling circuits, 3017
Wannier, G. H., motion of gaseous ions in strong electric field, 97
Ward, F. L., with T. Somerville, investigation of sound diffusion in rooms, 14
Ward, W. D., with I. J. Hirsh, recovery of auditory threshold after strong acoustic stimulation, 2418
Ware, L. A., transmission-line equivalent circuit, 316
Warmoltz, N., time lag of ignitrons, 1746; G-M counters, 3210
Warnecke, R., and P. Guénard, Les Tubes Électroniques à Commande par Modulation de Vitesse, (B)2095
—— with others, transmission lines with periodic structure, 3615; new u.h.f. oscillator valves with wide electronic tuning band, 3616
Warner, A. W., h.f. crystal units for primary frequency standards, 3481
Warnier, A., quality in broadcasting and compressor-expandor systems, 3559; C.F.T.H. applications of negative feedback, 3590
Washburn, E. M., with P. J. Herbst, frequency stability for television offset-carrier operation, 2913
Wasserab, T., ion-surge discharge in Hg-vapour rectifiers, 380
Wastable, A., radio control of model aircraft, 2309
Watanabe, K., properties of $CaSO_4$-Mn phosphor under ultraviolet excitation, 158
—— with others, measurements in rockets of solar ultraviolet radiation, 115; atmospheric ozone distribution to 70 km height, 2794
Watanabe, Y., equation for thermionic emission, 1892; noise figures of transistor circuits, 3389
—— and Z. Abe, s.w. narrow-band-pass crystal filters, 354
—— and N. Honda, theory of noise, in transistor, 870, in crystal rectifier, 3592
—— and S. Katsura, cut-off characteristic and potential distribution of magnetron, 2089
—— E. Takagi and S. Katsura, thermionic emission equation of oxide-coated cathode, 2083
—— with T. Nimura, effect of finite circular baffle on acoustic radiation, 1180
Watkins, D. A., travelling-wave-valve noise figure, 1470; effect of velocity distribution in modulated electron stream, 3289
Watkins, D. W., radar for traffic control at London airport, 1312
Watson, J. H. L., and W. L. Grube, reliability of internal standards for calibrating electron microscopes, 3521
Watson, R. B., radiation loading of piston source in finite circular baffle, 2413
Watts, B. N., with C. J. Milner, properties and applications of PbS photocells, 3596
Watts, J. M., polarization of l.f. ionosphere echoes, 2875
—— and J. N. Brown, effects of ionosphere disturbances on l.f. propagation, 246
Way Dong Woo. See Woo, Way Dong.
Webb, H. D., component selection for matched-channel d.f. receivers, 999
Webber, R. T., with P. B. Alers, anomalous magnetoresistance of Bi at low temperatures, 1629
Weber, H., information and transmission-channel capacity in communications, 1425, 1723
Weber, K. H. R., parallel voltage feedback, 94
Weber, P. E., barrier-layer photocells and derived theory, 1147
Webster, W. M., E. O. Johnson and L. Malter, anode-glow mode of hot-cathode arcs, 3068
—— with E. O. Johnson, plasmatron, 2659
—— with others, discharge modes for hot-cathode arcs, 959
Weekes, K., and R. D. Stuart, ionospheric propagation at about 100 kc/s, over short distances, (A)2577, 3533, over distances up to 1000 km, (A)2578, 3534
—— with S. Gnanalingam, weak echoes from ionosphere at 1·42 Mc/s 3427
Wei-Guan Lin. See Lin, Wei-Guan.
Weidemann, H., frequency measurement by capacitor charge method, 732, 2272
Weigall, D. B., Holme Moss television transmitting station, 1456
Weil, L., magnetostriction of ferrites oriented while hot, 2534
Weill, J., with A. Rogozinski, properties and applications of inverted triode, 2263
Weimer, P. K., and A. D. Cope, photoconductivity in amorphous Se, 1006
—— and N. Rynn, 45°-reflection-type colour kinescope, 846
—— S. V. Forgue and R. R. Goodrich, vidicon photoconductive camera tube, 1134
Weinberg, L., solutions of partial differential equations, with tables, 718
Weiner, J. R., with others, Binac digital computer, 1356
Weinstein, M. S., failure of plane-wave theory in predicting reflection of narrow ultrasonic beam, 2684
Weis, A., loss angle of Mn-ferrite cores, 429
Weiss, H., photoconductivity of ZnO, 3468
—— with H. Kleinwächter, flexible two-wire line for u.h.f. transmission, 2113
Weiss, P. R., with others, magnet current stabilizer, 760
Weissman, J. G., with B. F. Tyson, r.f. amplifier for u.h.f. television tuner, 370
Weissmann, S., with J. J. Slade, Jr, crystal structure imperfections in multicrystal low-carbon alloy and Si ferrite, 2533
Weisz, R. S., interatomic distances and ferromagnetism in spinels, 1347
Welford, N. T., SETAR electronic digital recording machine, 2810
Wells, F. H., pulse circuits for mass range, 1525; fast pulse amplitude discriminator and decade counter, 3006
Wells, G. M., with E. G. James, crystal triodes, 3268
Wells, H. W., combined sweep- and fixed-frequency ionospheric recording, 1299; ionospheric effects of solar eclipse at sunrise, 1st Sept. 1951, 2800
Wen Yuan Pan. See Pan, Wen Yuan.
Wendt, G., dioptrics of e.s. electron lenses, 227
Wensier, H., with others, u.s.w. propagation and meteorological influences, 3217
Went, J. J., Ni alloys, binary, spontaneous magnetization as function of temperature, 1330, homogeneous, linear magnetostriction of, 1331
—— and E. W. Gorter, magnetic and electrical properties of ferroxcube, 2823
—— and others, ferroxdure, 2824
—— with H. P. J. Wijn, magnetization process in ferrites, 1633
Wenzl, F., ions and electrons with uniform initial velocities in vacuo, 2649
Werner, P. H., measurement of speed of magnetic tapes, 1192
Werner, W., with F. Kerkhof, Fernsehen, (B)2643
Werrmann, H., design fundamentals for beam radio systems, 3234
West, D. W., with L. Levy, phosphors for c.r. tubes, 686
West, J. C., amplidyne phase-shift oscillator, 1553; remote-position-control servomechanisms, 2900
—— and J. Potts, simple variable-frequency phase meter, 3510
Westburg, V. B., with M. Chodorow, space-charge effects in reflex klystrons, 1177
Westcott, C. H., with others, ionospheric propagation of 16-kc/s waves over distances of about 540 km, 2871
Westermark, T., and L. G. Erwall, study of surface-potential distribution by means of radioactive deposits, 2773
Westfold, K. C., with J. G. Bolton, distribution of radio stars in galaxy, 1905
Westphal, W. C., with J. R. Haynes, drift mobility of electrons in Si, 2233
Wetzorke, F., whistle elimination in superheterodyne receivers, 487
Weyl, H., radiation capacitance, 1894
Whale, H. A., with D. H. Shinn, group velocities and group heights from magneto-ionic theory, 1405, (C)2009
Whalley, W. B., simplification of television receivers, 3257
—— and C. Masucci, analysis of crystal-diode operation in mV region, 3296
—— C. Masucci and K. Hillman, stabilization of vertical-deflection amplifiers, 1761
Wharton, W., with D. E. L. Shorter, portable 7·5-W loudspeaker amplifier, 2171
—— with others, equipment for acoustic measurements, 1681
Wheeler, D. J., with others, The Preparation of Programs for an Electronic Digital Computer, (B)1655
Whelan, F. G., with C. F. Miller, measurement of dissipation factor and dielectric constant, 2268
Whipple, R. T. P., with J. Heading, oblique reflection of long waves from ionosphere, 2873
Whitaker, L. W., e.m. scanning generators for television, 2347
Whitcraft, W. A., Jr, series expansion of Fourier integral, 433
White, E. L. C., with J. D. McGee, television camera tubes, (D)522
White, E. S., with others, C.B.S.-Columbia combined colour and black-and-white television receiver, 1758
White, H., and F. B. Partridge, Australian visual aural radio range system, 1314
White, J. E., with W. P. Bartley, alterations of characteristics of oxide-cathode valves, (A)3599
—— with D. L. Schaefer, physical processes in *L* cathode, 3280
White, S. D., with W. P. Mason, measuring forces and wear in telephone switching apparatus, 2561
Whitehead, E. A. N., microwave sweep-frequency impedance meter, 1673
Whitehead, S., Dielectric Breakdown of Solids, (B)709
Whiteley, A. L., servomechanisms, 1118
Whitney, I. B., with others, sensitivities of windowless and end-window counters, 1397
Whitney, P., remote-control system for f.m. broadcasting stations, 771, 1706
Whittaker, E., A History of the Theories of Aether and Electricity, (B)1591
Whittleston, W. G., symmetrical audio amplifier with negative feedback, 949
Wicher, E. R., effect of magnetic field on e.m. wave propagation in artificial dielectrics, 1587
Wideröe, R., 31-MeV betatron, 1993
Wieberdink, A., determination of complex permeability of Ni-Fe wire at v.h.f., 1667
Wiener, F. M., relation between sound fields radiated and diffracted by plane obstacles, 1493
Wienert, K., with others, diurnal variations of atmospheric electricity in the high Alps, 991
Wiese, H., geomagnetic field and winds in ionosphere, 1603, 1909
Wiesner, J. B., with others, application of correlation analysis to detection of periodic signals in noise, (D)479; assessment of speech-reinforcement systems, 572; new kind of v.h.f. radio propagation over long distances, 2581
Wigan, E. R., null-balance technique for filter measurement, 2847
Wigge, H., control coupling between oscillatory circuits, 356
Wiggin, L. J., measurement of magnetic print-through and its reduction, 2980
Wijn, H. P. J., and J. J. Went, magnetization process in ferrites, 1633
Wild, W., with E. R. Holiday, image converter for extending wavelength range of photomultiplier, 1067
Wilde, H., measurements on iron-cored coils in range 1 c/s–1 Mc/s, 196
—— with others, systematic relations between properties of Si/Fe-alloy stampings, 1631
Wildman, R. C., with others, computation of dielectric constants, 3166
Wiley, F. L., with O. C. Haycock, radiation patterns and conductance of slotted-cylinder aerials, 1842
Wilkes, M. V., thermal excitation of atmospheric oscillations, 392; programme arrangement in EDSAC computer, 1650; automatic digital computers, 1948
—— D. J. Wheeler and S. Gill, The Preparation of Programs for an Electronic Digital Computer, (B)1655
Wilkins, A. F., forecasts of sunspot variations to 1957, 888
—— and C. M. Minnis, comparison of ionospheric radio transmission forecasts with practical results, (D)2574
Willheim, R., with F. E. Butcher, magnetic-amplifier technique, 1849
William, E., charts and formulae for 2-stage band-pass filters, 1236
Williams, A. J., Jr, with others, d.c. amplifier with reduced zero-offset, 93
Williams, A. O., Jr, with A. H. Carter, expansion for velocity potential of piston source, (C)2412
Williams, E. M., with G. M. Anderson, transient response of asymmetrical carrier systems, 493
—— with J. B. Woodford, Jr, initial conduction interval in high-speed thyratrons, 3608
Williams, F. C., T. Kilburn and G. E. Thomas, magnetic store for universal high-speed digital computer, 2840
—— A. A. Robinson and T. Kilburn, circuits for universal high-speed digital computer, 2838
—— with others, quarter-square multiplier for analogue computer, 1022
Williams, F. E., with W. W. Piper, electroluminescence of single crystals of ZnS-Cu, 3439
Williams, H. J., and M. Goertz, domain structure of perminvar, 2532
Williams, L. E., space-charge reactance valve, 2947
Williamson, D. T. N., modifications of Williamson amplifier, 2485
—— and P. J. Walker, amplifiers and superlatives, 3387
Wilmarth, R. W., and J. L. Moll, 8–15-kMc/s oscillator, 2948
Wilmotte, R. M., interference reduction in f.m. receiver, 1421
Wilshaus, W., meter for mains voltage harmonics, 731
Wilson, D. G., with others, measurement of aerial impedance using receiving aerial, 585
Wilson, G. W., with L. F. Bates, new Bitter patterns on Ni single crystal, 701
Wilson, L. D., with others, Binac digital computer, 1356
Wilson, R., single-channel pulse amplitude analyser for coincident pulses, 2449
Wiltshire, L., with W. F. Lovering, a.c. bridge for measurement of permittivity of gases, 787
Winand, L., with others, e.s. generator giving over 1 MV and using glass-dust stream, 3517
Winlund, E. S., survey of r.f. transmission lines and waveguides, 1195
Wintle, M. F., precision calibrator for l.f. phase meters, 1981
Wintringham, W. T., colorimetry and colour television, 825, (C)2051
Winspeintner, G., introduction to filter theory, 2747
Witmer, K., aerial navigation aids, 683
Wittenberg, R. C., design of wide-band stagger-tuned i.f. amplifiers, 1562
von Wittern, W.W., with H. E. von Gierke, capacitor-microphone sensitivity measurement, (C)894
Witzig, M., lightning protection for l.v. systems, 507
Wlérick, G., directional effect in noise fluctuations of PbS-films, 2527
—— with W. Veith, effect of light on semiconductors, 1627
Wobst, J., improved reactance-valve modulator, 3286
Wolff, J. L., magnetic-amplifier voltage regulator, 1123
Wolter, H., characteristics of wide-band aerials, 2118
Woo, Way Dong, transit-time effect in cylindrical diode, 1784
Wood, E. A., detwinning ferroelectric $BaTiO_3$ crystals, 974
Woodford, J. B., Jr, and E. M. Williams, initial conduction interval in high-speed thyratrons, 3608
Woods, H. A., with H. Martin, l.f. noise spectra of hot-filament low-pressure discharges, 2942
Woods, J., with D. A. Wright, emission from oxide-coated cathodes in accelerating field, 2662
Woods, R. C., and J. K. Martin, testing of fine wires for telecommunication apparatus, 717
Woodward, J. G., vibrating-plate viscometer, 1686
Woodward, O. M., Jr, with others, omnidirectional high-gain u.h.f. aerials, 3001
Woodward, P. M., time and frequency uncertainty in waveform analysis, 797; information theory and design of radar receivers, 993
—— and I. L. Davies, information theory and inverse probability in telecommunication, 1724
Woolley, J. C., with others, effect of heat treatment on magnetic viscosity of permanent-magnet alloys, 3463
Wooster, W. A., with L. A. Thomas, piezocrescence, 705
Wouk, V., portable projection c.r.o., 1046
Wright, D. A., rare metals in valves, 1150
—— and J. Woods, emission from oxide-coated cathodes in accelerating field, 2662
Wright, G. T., drift-free single-channel pulse-height discriminator, 3008
—— with G. F. J. Garlick, characteristics of scintillation counters, 3528
Wright, E. M. B., with others, first British multichannel television receiver, 2915
Wright, R. W., effect of electron mean-free-path on electrical properties of non-metals, 1577
Wu, Ta-You, with H. E. Moses, O_2 dissociation in upper atmosphere, 129
Wunderlich, N. E., 450-Mc/s mobile radio service, 1729
Wurbs, A., aerials at Langenberg broadcasting station 1926–1951, 1838
Wurl, M., with H. Mosaner, growing piezoelectric crystals, 1346
Wüster, H. O., with K. Försterling, production of harmonics in ionosphere, 1081
Wüstner, H., division and multiplication of frequencies, 633
Wylie, C. R., Jr, Advanced Engineering Mathematics, (B)1653
Wylie, F. J., requirements for radio aids at sea, 1309, 1616
Wylie, R. G., and A. F. A. Harper, analysis of galvanometer amplifier and its response to alternating voltages and mechanical vibration, 1972
Wynn, J. B., Jr, and S. L. Ackerman, guided-missile test-centre telemetry system, 1990

Y

Yafet, Y., and C. Kittel, antiferromagnetic arrangements in ferrites, 3414
Yamaka, E., study of oxide-coated cathodes by X-ray diffraction, 1158
Yamamoto, T., with others, a.c. characteristics of Si *p-n* junctions, 1323
Yamanaka, S., with Y. Koike, triodes, electron transit-time reduction in, 871, microwave, amplification factor of, 3287
Yamasita, S., chart for matching-stub calculations, 1515
Yang, Chia-Chih, with others, quarter-square multiplier for analogue computer, 1022
Yanouchevsky, V., with others, clock with rate the true arithmetic mean of rates of several clocks, 3158
Yao-I, Chu. See Chu Yao-I.
Yarbrough, H., with others, probability distribution of phase of resultant of constant vector and one with Rayleigh distribution, 2251
Yardley, F. R., with A. Cross, broadcasting and rediffusion systems for colonial territories, 2336
Yarnes, D. C., editing machine for magnetic tape recording, 900
Yaru, N., supergain aerial arrays, 324
Yarwood, J., with D. H. Le Croissette, characteristics of Br-quenched G-M counters, 767
Yates, G. G., with K. G. Budden, search for radio echoes of long delay, 3079
Yates, J. G., with others, factors affecting design of automatic electron-trajectory tracer, 2852
Yin-Yuan Li. See Li, Yin-Yuan.
Young, A. H., with others, transparent luminescent films, 685
Young, A. S., with others, sealing sapphire to glass for photocells, 179
Young, C. B., with E. M. Mortenson, short-distance p.a.m. radio link, 2029
Young, F. W., Jr, with others, neutron bombardment of Ge, effect of, 168, and production of hole traps in, 1637
Young, L. G., with others, amplifiers for multichannel s.s.b. transmitters, [illegible]
Younglove, E. R., with R. L. Griffeth, mica paper for insulation, 3148
Youssef, H., with M. Mokhtar, mechanism of edge tones, 3303
Yurko, M., with others, radiation resistance of resonant transmission lines, 2987

Z

Zaalberg van Zelst, J. J., amplifiers with slightly variable gain, 362
Zadeh, L. A., time-dependent Heaviside operators, 432; linear systems, initial excitation of, 934, general theory of, 3028; general input-output relations for linear networks, 1225; operational analysis of variable-delay systems, 2460; theory of filtration of signals, 2464
—— and K. S. Miller, generalized ideal filters, 2147; fundamental aspects of linear multiplexing, 3552
Zaid, M., theory of stresses in glass butt seals, (D)2249
Zaitsev, A. A., oscillations in discharge as source of travelling striations, 2778
Zakheim, J., l.f. distortion due to h.f. phase shift, 2881
Zelkin, E. G., waves in a pyramidal horn, 2727
Zepler, E. E., network theorem, 1535
Zerbel, W., German carrier-frequency system V60, 259
Zernov, N. V., diffraction of cylindrical e.m. waves, 2771
Zetrouer, W. F., and W. J. Kessler, similarity of atmospherics waveforms, 678
Zhabotinski, M. E., coaxial resonators loaded by capacitance, 358
[illegible], L. V., and A. N. Efremov, effect of reactance in λ/4 Lecher system on permittivity measurements, 3491
van der Ziel, A., noise suppression in triode amplifiers, 1876; direct-reading instrument for valve noise, 1967
—— with A. J. Dekker, theory of production of secondary electrons in solids, 3069
—— with G. B. Herzog, shot noise in Ge single crystals, 1936
Zimmermann, H., i.f. amplifier and signal build up in television receivers, 2062
Zinke, O., transmission parameters for lines, waveguides and free space, 31; distribution of radiation resistance along rod aerial, 583; h.f. current measurement, 1040; current and voltage distribution along rotationally symmetrical aerials, 2437
—— with H. H. Emschermann, capacitance measurement at h.f., 1081
Zinn, M. K., network representation of transcendental impedance functions, 2139
Zisler, S., plane aerials of small width, 584; influence of plane reflector on input impedance of thick cylinder, 587
Zoller, W., design of Resorbit arresters, 815
Zuhrt, H., theory of dipole aerials, (D)920

SUBJECT INDEX

SYMBOLS (A) Abstract, (B) Book Review, (C) Note of Correction, (D) Discussion

A

Abacs, (See also Charts)
  for attenuation of TM_{11} mode in square waveguide, 1836
  for dielectric constant and absorption at cm λ, 1367
  for TE_{11}-mode piston attenuator, 2467
  for temperature-compensation capacitors in parallel, 345
Absorption, (See also Acoustics; Ionosphere)
  acoustic, in gases and liquids, general theory of, 3315
    by materials, with perforated facings, 311, 2697, theory of, 1818
    by perforated sheets, experimental investigation of, 2696
    by porous material 'betamianto', 12
  acoustic and ultrasonic, in gases, 1497
  at cm λ, abac for, 1367
  coefficient, acoustic, of fir plywood panels, 310, of hallonit, 2420, measurement by free-field method, 309
  infrared, of amorphous Se, 3128
  ionospheric, analysis of variations of, 3538
    comparison of results at Slough and Freiburg, 984
    in D and E layers, 985
    at high latitudes, association with aurora, 2511
    and in solar corona, effect of electron collisions on, 2798
    s.w., and electron distribution, 1300
  microwave, by opalescent binary liquid mixtures, 2492
    reduction of Doppler line broadening, 2207
  ultrasonic, in electrolytes, anomalous effect in, 1806
    in gases and liquids, 1504
Accelerometers, piezoelectric, $BaTiO_3$-ceramic, 747, 748
    reciprocity calibration of, 3516
Acoustics, (See also Absorption; Broadcasting studios; Impedance; Sound; Ultrasonics)
  of ancient theatres, 565
  artificial ear, for calibration of telephone receivers, 306
    comparison between various types and human ear, 1814
  bibliography, 293, 1487, 1797, 2406, 2675, 3298
  of broadcasting studios, effect of sound-diffusing walls, 569
    Maida Vale, London, 1508
    pulse equipment for measurement of, 1681
    recent progress in, 3316
    standing-wave patterns in, 2975
    use of Helmholtz resonators as sound absorbers, 2424
  of buildings, radiation problems in, 2972
  design and analysis of subjective measurements in, 2968
  detector of transients and applications in study of music and speech signals, 2417
  effect of reflections on sound pattern of studio microphones, 3323
  of halls, influence of chandeliers on, 1190
    reflection effects in, 2974
  of organs, 886
  radiation impedance of rectangular plate with infinite baffle, 301
  of recording studios, 568
  of rectangular room, effect of sound-source harmonics on, 3319
  of remodelled Chambers at the Capitol, Washington, 2421
  reverberation times, in baroque churches, 3321
    direct measurement of, 1817
    of 10 British concert halls, 3320
  of rooms, correlation coefficient as criterion of, 2973
    effect of various diffuser elements on, 14
    and quality of reproduction, 2694
    and reverberation-radius concept, 1188
    from viewpoint of singer and speaker, 2103
  of Royal Festival Hall, London, 13, 567
  standing waves, demonstration of, 1489
  of theatres, investigations in Budapest, 2104
    use of artificial reverberation, 566
  threshold and loudness of repeated bursts of noise, 1502
Adsorption, of W on W and Ba on W, electron-microscope study of, 1077
Aerial arrays, broadside, dielectric, 1205
    Tchebycheff-type, calculation of current distribution of, 1211, (C)3002
  directive, circular, with cylindrical reflector, 1212
    semicircular and semicylindrical, with cylindrical reflector, 325
    wide-band, for u.s.w. beam links, 3354
  linear, broadside, supergain, impractibility of, 324
    dipole, u.h.f., 45
  ring, directive, theory of, 1518
Aerials, (See also Lenses, microwave; Radiation; Transmission lines)
  aircraft, cavity, glide-path, for jet-driven fighters, 921
    external and suppressed, survey of, 2725
    slot, field investigations for, 48
    use of complementary slots in impedance measurements on models, [illegible]
  bandwidth increase by means of compensation circuits, 39, 3350
  beam, specification of sharpness of cut-off for, 3357
  biconical, symmetrical, general theory of, 1516
  broadcasting, antifading, top-feeding of, 51
    directive, signal distortion by, 2800
    f.m., high-power, WMIT, 1207
    Langenberg, 1926–1951, 1838
    medium-wave, double-feed, experience with, 2439
    u.s.w., 43
    vertical, multiple-feed, theory of, 2138
    v.h.f., Wrotham, 916
  cage-type, for v.h.f. omnidirectional radio range, 3097
  centre-loaded, receiving, improved theory of, 3351
  with circular ground screen, impedance of, 586
    radiation pattern of, 3006
  conducting-ribbon, current distribution due to incident plane e.m. wave, (A)2441, 2723
  corrugated-surface, annular, 2442
    end-fire, microwave, 922
  coupled and folded dipole, current distributions along, 917
  cylindrical, current distribution along, 2119
    and feeders, current and charge distributions on, 592
    solution of Hallén's integral equation for, 2715
    thick, influence of plane reflector on impedance of, 587
  dielectric-lens, for marine navigational radar, 327
  dielectric-rod, radiation patterns of, 2121, and gain of, 1204
  dipole, above conducting plane, radiation from, theory of, 330, 915
    crossed, λ/2, mutual impedance of, 589
    cylindrical, gain and back-scattering cross-section of, 2716
    near ellipsoid of revolution, radiation resistance of, 2997
    horizontal, near ground, input impedance of, 2722
    with tuned parasitic radiator, 1202
    Zuhrt's theory of, (D)920
  dipole and slot, mutual coupling of, 1835
  directive, with increased line-wavelength, 3353
    nonrotating, vertical, 595
    with single reflector, design of, 3352
    transmitting, at Herstedvester, Denmark, 1736, for λ 3 cm–3 m, for beam stations, 328
  earthing system, radial-conductor, design of, 2729
  feeders for, abac for efficiency of, 330
    cage-type, 3431
    long, efficiency at v.h.f., 2116, multiple reflections in, 2719
  frame-coil and stretched-wire loops, comparison for ship d.f., 2517
  helical, with sinusoidal current, radiation field of, 596
    square, with few turns, radiation characteristics of, 2995, radiation field of, 2726
  horn, application of transmission-line theory to, 29
    theory of, 1841, (C)3006; 2727
    waveguide excitation of, analysis of, 46
  impedance measurement by two methods, 585
  inverted-L, 79·15-kc/s, at Barcelona, 42
  isotropic, proof of impossibility of, 37
  lens, u.h.f., new type of, 2443
  lens-type, for TD-2 relay systems, 2122
  loop, with ferrite cores, 1520
    for field-strength meters, calibration of, 452
  masts for, construction and erection of, 1736
  microwave, automatic wave-front plotter for, 1380
    for relay stations, optimum-height determination by helicopters, 498, prism-type, for dm λ, 3003
  omnidirectional, for naval use at 225–400 Mc/s, 593
    wide-band, for m and dm λ, 919
  parabolic, microwave, practical design of, 2447
  parallel, identical, self and mutual impedances of, 2999
    input-impedance calculation for, 326
  plane, of small width, 584
  polar diagrams of, Fourier analysis for calculation of, 1422, (D)1720
  progressive-wave, 36
  radar, rapid-scanning, design of, 2445
  radiation characteristics of, calculation by Kirchhoff's formula, 3000
  receiving, radiation or diffraction patterns near, (D)2187
  inside rectangular waveguide, radiation from, 1199
  rhombic, with arbitrary termination impedance, radiation distribution of, 1213
    horizontal, design data for, 2728
  rod, radiation resistance of, distribution of, 583
  rotationally symmetrical, current and voltage distribution along, 2437
  shaped-beam, calculation of, 923
  slot, annular, theory of, 323
    and application to aircraft, 2724
    in circular waveguide, theory of, 2720
    with directive element, 2717
    electrolyte-tank measurements of aperture parameters, 725, (C)1365, 3490
    input impedance of, 1839
    theory of, 2718
    waveguide-fed, radiating into parallel-plate regions, 3343
  slotted-cylinder, radiation patterns and conductance of, 1842
  superdirective, impracticability of, 2120
  television, at Buenos Aires, 1209
    receiving, characteristics of, 2440, and feeders for, 576, horn-type, 329, u.h.f., characteristics of, 1517, u.h.f., performance tests on, 1840
    transmitting, 1208, directive, supergain, for KRON-TV, 40, helical, side-fire, 44, u.h.f., 1449
  theory of, Booker's extension of Babinet's principle, 2436
  with thickness discontinuities, theory of, 1203
  transmitting, u.h.f., high-gain, omnidirectional, 3001
  tuning and matching of, 38
  turnstile, with tubular shield, radiation characteristics of, 2996
  u.s.w., measurement of radiation of, 1519
  V-type, theory of, 918
  waveguide, uses of ferrites in, 2721
  wide-band, 2117
    characteristics of, 2118
    folded-fan, 590
  wire, mutual impedance of, 588
  for λ 3–10 cm, measurement of radiation characteristics of, 2446
Aether, existence of, 1573, (D)2203, (D)2769
Aircraft, r.f. current distribution on, 47
Alloys, (See also Ferromagnetic materials)
  Al, effect of alloying elements on resistivity of, 1646
  Ni-Cu and Pd-Ag, structure and physical properties of, 2542
Amplification, distributed, circuit design for, 2167, (D)2760
  by means of relativistic effects, possibility of, 3383
  selective, at low frequencies, 1563
  travelling-wave, with coupled transmission lines, 867, (C)1469
Amplifiers, a.c., compensation of heater-voltage variation in, 2761
  a.f., with adjustable nonlinear distortion, 26
    British, review of, 1245
    capacitor-microphone, input-circuit design for, 637
    cathode-follower, 947
    damping factor of, 365
    microphone, construction of, 950, portable, with miniature valves, 946
    push-pull, single-end, 1250, 1558
    reduction of distortion and output impedance by feedback, formulae for, 1566
    symmetrical, with overall negative feedback, 949
    tunable shunt selector-rejector for, 1249
    ultralinear, 1512
    Williamson, examination of American claims for improvement of, 3387, modifications of, 2485
    7·5-W, for loudspeaker, 2171
  analysis by means of V_a/V_g characteristics, 2168
  cathode-coupled, analysis and design of, 1559, (D)2480
  d.c., driftless, for REAC analogue computer, 1877
    with low zero-offset, 93
  dielectric, using capacitors with ferroelectric dielectric, 1561
  differential, direct-coupled, and mathematical applications, 366
    for discriminating against push-push signals, 3392
  direct-coupled, feedback, compensation of zero-drift errors in, (D)1252
    frequency-compensated, for 4-channel pen recorder, (D)1878
  for electrical measurements, review of, 723
  feedback, dual circuit of, 1564
    equivalent circuits for design of, 1565
    stability of, 367
  frequency response of, effect of feedback on, 2482, (D)3386
  galvanometer, analysis of, 1972
  h.f., for multichannel R/T transmitters, 2923
    narrow-band, calculation of, 92
  i.f., miniature, N.B.S. Model VI, 1246
    rules for construction of, 2169
  line, for broadcasting programme transmission, 2468, German, Type 48, 1233
  for low-temperature operation, 1875
  magnetic, improvements in, 2132, 2732
    multistage, compensation of quiescent current in, 2731
    noise figure of, 924
    with Orthonol-tape cores, 925
    parallel-connected, with resistive loads, analysis of, 3014
    prediction of control curves for, (A)3012
    properties of basic types of, 3362
    response time of, 3013
    self-saturable, analysis and design of, 337, steady-state performance of, 3016
    technique of, 1849
    time constant of, 927
    transient response of, (A)926
    transients in, analysis of, 2133
  m.f., with reduced phase distortion, 951
  negative-feedback, Class-A, distortion and power output of, 95
    matrix analysis of, 952
    overloading under pulse conditions, 2764
    with specified amplitude/frequency characteristics, 642
    transient response of, 1879
    wide-band, transients in, 96
  network representation of admittances of, (C)641
  pentode, application of complex feedback in, 2173
    with positive feedback, 953
  photoelectric, 2287
    using gas-discharge triode, 873
  power, Doherty, theory of, 3390
    r.f., overvoltage effect in, 1560
    using transistors, 3388
  pulse, design theory for, 363
  push-pull, 'cathamplifier', 2172
    class-B, with choke output, nonlinear distortion in, 90
    integrating, for c.r.o. recording of magnetic flux, 2876
  RC, distortion of N-shaped signals in, 2484
    low-pass, for very low frequencies, 3391
  resistance-coupled, theory of, 2763
  series-connected, 1247
  stabilization of gain of, 362
  transient response of, calculation of, 2762
  transistor, circuits and construction types of, 640
    operation and characteristics of, 639
  travelling-wave, wide-band, frequency-sweep test methods for, 212
  triode, noise suppression in, 1876
    resistance-coupled, h.f. characteristics of, 1251
  for use in low-current measurement, reduction of response time of, 1364
  video, effective bandwidth of, 3050, 3385
  volume-control, control-curve calculation for, 86
  wide-band, design of, 948
    i.f., radar, design of, 89, stagger-tuned, 2176, stagger-tuned, simplified calculations for, 1562
    multistage, using maximally-flat-delay networks, 3375
    for use in measurements of atmospherics, 1248
  1–200 c/s, background noise in, reduction of, 2483
Analogue, electrical, of motor-car suspension system, 1060, (D)2563
Analysers, distortion, for a.f. range, 2106
  frequency-spectrum, a.f., for aperiodic phenomena, 2271, using gated amplifier, 3170, heterodyne-type, 3171, octave-band, for acoustic measurements, 2969, recording-type, 9
    h.f., high-resolution, 1050
    for mm waves, 2260
    10–300-kc/s, with crystal filter, 1962
  pulse-amplitude, 603, 1214, 1846
    and decade counter for, 3009
    high-speed, 604
    mechanical, 54
    multichannel, for scintillation counters, 3010
    single-channel, 3008, for coincident pulses, 2449
    for time-interval measurements, 3157
    10-channel, 2130
  waveform, Muirhead-Pametrada Type D-489, adaptor for range extension to 2 c/s, 3182, applications in aircraft-engine research, 3181
Analysis, of experimental curves, for determination of physical characteristics, 373
  of experimental data, corrections in, 1256
  Fourier, and negative frequencies, 1422, (D)1720
  graphical, for nonlinear systems, (A)1945, 2836
  harmonic, of distorted oscillation after limiting, 193
    and symbolic calculus, graphical method for, 2779
Antiferromagnetism, lowest energy state of linear chain, 2199
  quantum theory of, 2200
  theory of, 1579
Astronomy, radio, 668, 1278 (See also Cosmic radiation; Solar radiation)
    interferometer equipment for, 2497
    radio stars, annual parallax of, 1903, distribution in galaxy, 1905, long-period intensity variations of, 979, in northern hemisphere, survey of, 121, positions of, 978, and radio nebulae, 2214
    265-ft steerable telescope for Manchester University, 3074
Atmosphere, (See also Ionosphere; Stratosphere; Troposphere)
  conductivity at 1-m height and at ground level, 2806
  near ground, height variations of ion concentration in, 410, 1608
  ionization produced near ground by radioactive substances, 412
  lower, electrical conductivity of, 411
  oscillations in, thermal excitation of, 392
  ozone content during sudden ionospheric disturbances, 1604
  ozone distribution to 70-km height, 2794
  pressure, density and temperature up to 160-km height, 2506
  seasonal temperature changes at Habbaniya, 1599
  troposphere and stratosphere, ozone variations in, 1911
  upper, dissociation of oxygen in, 129
    review of knowledge of, 1291
    temperature equilibrium of, 988
Atmospheric electricity, air-earth current observations, 408
  current through thunderclouds, 414
  distribution of electrical currents near thunderstorms, 2807
  distribution in thunderclouds, 413, 1303
  diurnal variations in high Alps, 991
  electrical and meteorological conditions in thunderclouds, 1607
  fundamental ideas on, 409
  point-discharge currents, 3086
    and earth's electric field, 1304
  potential gradient, 407
    and air-earth current, recorder for, 1028
  relation between point-discharge current and field, 3085
Atmospherics, a.f., frequency analysis of, 416
  automatic waveform recorder for, 679
  recording in *Commandant Charcot*, 1950–1951, 1305
  similarity of waveforms of, 678
  statistical approach to measurement of, 1953
  study of, and weather prediction, 415
  waveform associated with tornadoes, 3429
  waveforms of, 2809
Attenuation, of ultrasonic waves in solids, measurement of, 2099
Attenuator, magnetically controlled, for u.h.f. oscillator, 1237
  piston, TE_{11}-mode, abac for, 2467
  waveguide, using multihole coupling, 2150
Aurora, relation to absorption and Es ionization at high latitudes, 2511

B

Batteries, and accumulators, for telecommunications, 2694
  dry, miniature, high-capacity, type-RM, 2048
  h.v., small-size, 1437
  reversible cell with evaporated thin crystal plate as electrolyte, 3571
Beacons, See Navigation aids.
Book notices and reviews:
  Advanced Engineering Mathematics, 1653
  Advanced Theory of Waveguides, 600
  Advances in Electronics, Vol 3, 2674
  The Aurorae, 1919
  Bases Techniques de la Télévision, 1460
  Bauelemente der Nachrichtentechnik, Teil 2, Widerstände, 954, Teil 3, Spulen, 1254
  Centimetric Aerials for Marine Navigational Radar, 2127
  Circuits in Electrical Engineering, 1568
  La Cybernétique, Théorie du Signal et de l'Information, 3339
  Dielectric Breakdown of Solids, 709
  Dynamik selbsttätiger Regelungen, Vol. 1, 511
  Echo Sounding at Sea (British Practice), 2226
  Einführung in die neue deutsche Fernsehtechnik, 533
  Einführung in die Theorie der Ausbreitung elektromagnetischer Wellen in Leitungen und Hohlkabeln, 1843
  Electrical Measurements, 3187
  Electromagnetic Waves and Radiating Systems, 599
  Electronic Valves, Book V—Application of the Electronic Valve in Radio Receivers and Amplifiers; Vol. 2—A.F. Amplification, the Output Stage, Power Supply, 2765
  Electronics, 290, 1080
  Die elektroakustischen Wandler, 906
  Elektronenröhren und ihre Schaltungen, 2098
  Elements of Television Systems, 1145
  Empfangsprobleme im Ultrahochfrequenzgebiet, unter besonderer Berücksichtigung des Halbleiters, 2591
  Fastperiodische Funktionen, 436
  Felder und Wellen in Hohlleitern, 53
  Fernsehen, [illegible]

Ferromagnetism, 666
Fundamentals of Automatic Control, 1707
Funkpeiler, Grundlagen und Anwendungen, 2228
Gleichrichtermesstechnik, 213
Guide to Broadcasting Stations, 809
High-Frequency Measurements, 746
A History of the Theories of Aether and Electricity, 1591
Les Hyperfréquences (Tubes et appareils de mesure. Applications aux télécommunications et au radar), 2405
Integral Transforms in Mathematical Physics, 435
Introduction to Electronic Circuits, 1792
An Introduction to Servomechanisms, 510
Introduction to the Theory of Probability and Statistics, 1361
Leitfaden der Funkortung, 2816
Mathematics of Relativity, 1590
Modern Magnetism, 1277
Modern Plastics Encyclopedia and Engineer's Handbook, 1951, 181
Die Ortskurventheorie der Wechselstromtechnik, 371
The Oxide-Coated Cathode, Vol. 1, Manufacture, 2094, 2955, Vol. 2, Physics, 2956
The Photographic Study of Rapid Events, 2049
Die Photozellen, 2398
Praktische Stabilitätsprüfung mittels Ortskurven und numerischer Verfahren, 372
The Preparation of Programs for an Electronic Digital Computer, 1655
Propagation of Short Radio Waves, 478
Pulse Techniques, 1567
Quantum Mechanics of Particles and Wave Fields, 1276
Radio Amateur's Handbook, 20th edn, 1796
Radio Handbook, 13th edn, 1795
Radio Installations, 500
Radio Research Special Report No. 21. Radio Direction-Finding and Navigational Aids; some Reports on German work issued in 1944–45, 3100
Radio Research Special Report No. 22. Siting of Direction Finding Stations, 2227, 3099
Radio Valve Data, 1483
Rundfunkröhren. Band 1951, Eigenschaften und Anwendung der neuen UKW-Röhren, 1484
Selected Government Research Reports, Vol. 5, Servomechanisms, [illegible]
Semiconducting Materials, 1648
Servomechanisms and Regulating System Design, 816
Statistische Methoden für Naturwissenschafter, Mediziner und Ingenieure, 1654
Synthesis of Electronic Computing and Control Circuits, 1656
Tables of Bessel Functions of the First Kind of Orders 79–135, 1026
La Technique du Vide, 180
Television and F.M. Antenna Guide, 1844
Theory and Application of Industrial Electronics, 1401
Theory and Design of Television Receivers, 1146
Theory and Design of Valve Oscillators, 1255
Transient Analysis in Electrical Engineering, 716
Transients in Electrical Circuits, using the Heaviside Operational Calculus, 2177
Travelling Waves on Transmission Systems, 2125
Les Tubes Électroniques à Commande par Modulation de Vitesse, 2095
TV Master Antenna Systems, 2126
Verstärker und Empfänger, 955
Waveguide Handbook, 3358
Die zweidimensionale Laplace-Transformation, eine Einführung in ihre Anwendung zur Lösung von Randwertproblemen, nebst Tabellen von Korrespondenzen, 1360
Breakdown, of gases at 2·8 kMc/s, 650, 2774
in H at low pressure, secondary ionization in, 102
h.f., in gases, 956
spark, in air, mechanism of, 3405
in N, mechanism of, 3404
in vacuum, theory of initiation of, 3065
Bridges, a.c., c.r. tube as indicator for, 207
for measurement of permittivity of gases, 737
admittance, for measurements on piezoelectric crystals, 1675
a.f., self-tracking detector for, 1042
impedance, bridged-T, v.h.f., (A)2557, 3508
for m.f. aerial measurements, 205
inductance and capacitance, 206
measurements with, effects of harmonics on, 344
precision, for time constants of resistors, 3180
RC, selective, for frequency control of a.f. oscillator, 1976
resistance, sensitivity of, 3506
Schering, elimination of stray-capacitance errors in, 3504
h.v., for dielectrics research, 3507
self-balancing, for microwave power measurement, 204
Wheatstone, with load-dependent resistors, 446, applications of, 1975
Broadcasting, common-wave, and hyperbolic navigation systems, similar problems of, 2515, 3437
Südwestfunk, radio synchronization of, 2618
medium-wave, coverage in the N.W.D.R. area, 3238
of music, problems of, 3325
quality in, and compressor-expandor systems, 3559
radio-diffusion amplifiers for standard telephone circuits, 2468
and rediffusion systems for Trinidad, 2336
relay equipment on U.S. ship for Voice-of-America programmes, 3557
service, present and planned, for Italy, 805
studios, for Laibach station, 2897
operation of and new S.F.R. equipment for, 1113
of Radiodiffusion Française, acoustic treatment of, 3318
s.w., using vertical radiation, 2335
transmission quality, 3541
in tropics, effect of sunset ionospheric conditions on, 2820
v.h.f., a.m. in, 2026
B.B.C. scheme for, 1434
experience with f.m. in U.S.A., 2899
f.m., in Western Germany, 1733
—— **stations,** in Denmark, planning of, 1736
at Skive, Denmark, 1736
and studios, of N.W.D.R., 2615
s.w., Allouis-Issoudun group of Radiodiffusion Française, 1735

C

Cables, for broadcasting networks, C.C.I.F. recommendations for, 28
coaxial, effective resistance and inductance of, 575
irregularities in, pulse methods for location of, 1386
junctions, for, calculation of transmission characteristics of, 2985, reflection-free, 2429
reflections due to impedance irregularities in, (A)2554, 3495
television transmission tests on, 1439
coaxial-pair, reflectionless joints for, 3337
multicore, for television camera, 2984
multipair, spacing and dielectric constant of, 27
with Telcothene insulation, properties of, 1826
Calculating machines. See Computers.
Capacitance, e.s., of conductor, calculation of, 3073
low, measurement of, 726
measurement at h.f., 1031
Capacitors, with ceramic dielectric, 65, 1222
electrolytic, low-temperature tests on, 2136
review of, 933
harmonics of current through, 344
polystyrene film, charge storage in, 932
pyralene impregnated paper, factors affecting losses in, 3090
r.f. characteristics of, 2740
tantalytic, 1223
variable, ganged, equipment for alignment of, 2861
rotary-plate, profile calculation for, 2741
substandard, with micrometer adjustment, 450
wire, drawn, 1853
Carrier-current systems, with asymmetrical a.m., transient response of, 498
German, V60, transmission characteristics of, 259, 2596
power-line, 1063, (A)1192
s.s.b., British, 1426
s.s.b. and telemetry equipment for, 801, 1728
Type-N equipment for, 2024
s.s.b., distortion-free, 1725
telephony, use of pulse modulation in, 2605
Cathode-ray oscillograph, for comparing valve characteristics, 2854
for display of a.f. response curves, 1047, 2277
for display and measurement of envelope-delay distortion, 2286
for display of transistor characteristics, 3184
h.v., momentary beam intensification for, 739
for impulse testing, 1045
for measurement of phase angle, 2857, (D)2858
for plotting microwave fields, 448
production of 3-dimensional characteristics with, 1977
recording, for rapid transients, 1978
4-channel, 738
6-channel, 1048
single-beam, for simultaneous display of several phenomena, 1044
for testing distance-measuring equipment, 1002
—— **oscilloscopes,** astigmatism correction for, 1049
for examination of television-receiver waveforms, 2559
for neurophysiological research, 753
projection, portable, 1046
—— **tubes,** (See also Television)
deflectron internal e.s. deflection yokes for, 3290
as indicators for a.c. bridges, 207
ion burn and its elimination, 3613
manufacture of, use of rare metals in, 1150
monoscope, for simulation of radar directivity pattern, 2867
review of progress in, 1788
spot-distortion correction in, (D)2088
storage, 554
analysis of processes in, 2668
for binary pulses, 876
for parallel computer, 1174
Type-IBM-79, 2945
Cathodes, (See also Electron emission)
capillary, metal, thermionic data for, 1155
hollow, for study of positive ions in c.r. tubes, 1172
indirectly heated, drawn, 1853
L-type, 548
heavy duty, 2080
physical processes in, 3280
magnetron, enhanced emission from, 1176
materials for, thoria, conductivity and other properties of, 869
oxide, in accelerating field, emission from, 2662
activation in high-vacuum valves, 3278
BaO-on-W, chemical reactions in, 3279
(Ba-Sr)O, effect of illumination on thermionic emission from, 549, *p-n* transition in, 1472
electronic temperature of, 1471
emission of, and crystal size of, 2379, effect of core material on, 2079, effect of ion bombardment on, 1157
initial decay of current from, 868
interface layers in, properties of, 2378
interface resistance and capacitance of, 1661
layer-thickness variation of resistance of, 2381
μs pulsed emission of, 2661
poisoning by atmospheric sulphur, 2081
pulsed, anomalous electron-velocity distribution of, 2380
pulsed operation of, 3600, emission mechanism of, 550
in receiving valves, life of, 1781
space-charge effect in coating of, 2082
study by X-ray diffraction, 1158
thermionic emission and electrical conductivity of, 3277
thermionic-emission equation for, 2083
use of radioactive isotopes in study of evaporation of, 3601
work function for, 1156
photoelectric, Li-Sb, 858
Charts, (See also Abacs)
for a.f. response of reactance networks, 1539, 1540, 2746
for a.f. transformer design, 1216
for complex-quantity calculations, 3359
for cut-off frequency of rectangular waveguide, 1514
for determination of dielectric constant from waveguide measurements, 3166
for field-strength/power-density conversion, 245
for Lecher-wire matching stubs, 1515
for low-power mains transformer design, 1527
for multivibrator design, 1556
for network design, 322
for permittivity determination at u.h.f., 2270
for phase shift and attenuation of RC coupling networks, 3021
service-area, for v.h.f.-u.h.f. television, 3263
for solenoid coil design, 3365
and tables, for parameters of 2-stage band-pass filters, 1236
for television fringe-area reception calculations, 1457
3-dimensional, construction of, 714
Chokes, mean winding length of, determination of, 61
Circle diagrams, recorder for a.f. range, 740
Circuit theory, (See also Networks)
waveform correction by use of 'time equalizers', 72
Circuits, (See also Networks)
adding and counting, for EDVAC digital computer, 1357
and assemblies, miniaturization techniques for, 1549, 2754
cathode-follower, with capacitive load, frequency dependence of input impedance of, 87, operation of, 2481
series connection for high impedance-transformation ratios, 945
clipper, cathode-coupled, speed of response of, 941
compensation, increase of aerial bandwidth by, 39, 3350
complex power and impedances of, 1854
coupled, quadripole theory for, 78
theory of pull-in effect for, 3379
triple-tuned, analysis of, (C)1240
tuned, input-admittance characteristics of, 1241, (C)2157
electrometer, valve, mains-supplied, stabilized, 1669
equivalent, review of, 601
for 6-pole and higher-order-multipole networks, 355
feedback, linear and pseudolinear, application of matrix calculus to, 2145
with and without feedback, transfer properties of, 70
flip-flop, delay, for flash-bulb release, 1232
Eccles-Jordan, transition in, 62
'ferroresonant', and application in counters, 1852
as pulse-amplitude comparators, 2164
frequency-converter and oscillator, using balitron valve, 2388
with frequency-dependent resistance and frequency-independent reactance, 3023
linear, passive, pulsed, transmission function for, 2466
linear-rectifier and balanced-limiter, analysis of, 2588
multivibrator, c.r.o. display of switching in, 931
multivibrator and flip-flop, use of transistors in, 1555
nonlinear, operational analysis of, (C)613
with nonlinear resistor, 'internal resonance' in, 75
oscillatory, analogue-computer study of, 943
control coupling of, 356
h.f., constant-frequency, 74
response to linear-frequency-sweep voltage, 942, 3041
printed, practical assembly of, 629
pulse, for mμs range, 1525
pulse-sharpening, 2476
RC-coupled, maximum pulse sharpness in, criteria for, 631
rectifier, h.v. and 'centre-tapped', 3565
relay, application of Boole's algebra to synthesis of, 2135
resonant, with periodically varying resistance, 2471, (D)2756
with small nonlinearities, analysis by equivalent circuits, 3026
switching, compact, using Se rectifiers, 3017
n-terminal, 73
transistor, noise figures of, 3389
valve, application of matrix theory to, 2744
application of 'reversal' concept to, 346
v.h.f., small-signal analysis for, 2137
Clerk Maxwell, memorial lecture, 2400
Clocks, 'atomic', and frequency stabilization by means of microwave spectral lines, 1659
electronic, ultimate accuracy of, 2163
with rate the arithmetic mean of the rates of several clocks, development of, 3458
Clutches, magnetic-powder, 3191
piezoelectric-crystal, high-speed, for computers, 1690
Codes, (See also Communication, theory of)
minimum-redundancy, construction of, 3546
use of linear systems, 3547
Coils, (See also Inductors)
with ferromagnetic cores, distortion in, 2454
helical, e.m. field of, 1580
iron-cored, measurements on, in range 1 c/s–1 Mc/s, 196
for magnetic devices, design charts for, 3365
multilayer, internal capacitance of, 342
repeater, with divided secondary, 1548
for line transmission of music, study and tests of, 2469
solenoid, single-layer, a.c. resistance of, 609
Colour pictures, additive, subjective tests of sharpness of, 830
Communication, theory of, application of probability calculus in, 3225
and application to taxonomy, 2960
basis of, 488
channel capacity and system transit time, 3543
comparison of signalling alphabets, 2594
concepts of information and transmission capacity in, 1425, 1723
definition of information, 1423
and design of radar receivers, 993
and efficient coding, 2888, for communication or memory devices, 1099
entropy of transmission system, 1098
history of, 258
information aspect of some uncertainty relations, 1597
information and energy, relation between, 2595
and instantaneous power spectra, 2326
and inverse probability, 1724
nonmathematical, 3224
and 'observation operators', 1570, 1898
prediction and entropy of printed English, 1424
Shannon's, discussion of, 2327
simple explanation of, 3544
and use of quantized signals, 3545
Wiener's, 2887
—— **equipment,** (See also Receivers; Transmitter-receivers; Transmitters)
in French navy, 1116
h.f., transportable, for telegraphy and telephony, 263
microwave, multiplex, 497
mobile, Type SRR 178, 2035
—— **systems,** (See also Carrier-current systems; Radio links; Radiotelegraphy; Radiotelephony; Relay systems; Telegraphy; Telephony)
air/ground, future developments in, 2037
optimum ground-station aerial height for frequencies > 50 Mc/s, 2334
for aircraft, service range for frequencies > 50 Mc/s, 2616
a.m., s.s.b., with carrier suppression, analysis of, 2360
'ambiguous-index', 2889
for Australian flying-doctor service, 1727
design calculations for, 1428
developments in, review of, 800
f.m., distortion in, due to aerial-feeder mismatch, 2602, due to loss and phase variations, 2027
multichannel, 3551
use of negative feedback to reduce distortion in, 1427
long-distance lines and links, evolution of, 490, 2593
mobile, selective calling equipment for, 1737
v.h.f., switching methods for, 2036, for taxicabs in London, 1114
450-Mc/s, Chicago, 1729
multiplex, linear, theory of, 3028, 3552
p.c.m., background noise and distortions in, 2331
distortion in, analysis of, 2332
p.ph.m., dm-wave, parameters of, 804
p.w.m., 960 Mc/s and 2 kMc/s, 3229
relay, multichannel, for industry, 940–960-Mc/s, 494
u.h.f., for Pennsylvania turnpike, 1730
wide-band, f.m., asymmetry of frequency swing in, 267, long-distance, measurement techniques for, 2551
for short waves, 3226
s.s.b., using envelope elimination and restoration, 2925
time-division-multiplex, crosstalk in, 1104
p.p.m. and p.w.m., crosstalk in, (A)2606, 3556
time-sharing, multiplex, 2604, nonsynchronous, 3231, 3555
u.h.f., using moon as reflector, 2008
v.h.f. and u.h.f., techniques for close channel spacing in, 2025
Compandors, 'instantaneous'-type, theory of, 260
use on narrow-band speech channels, 1112
Compasses, earth-inductor, stroboscopic, for aircraft, 1621
Components, for electrical instruments, 1865
microwave, use of flat-strip technique for, 2705
new, in world market, 628, 2673
nonlinear, and applications in a.f. and r.f. circuits, 3039
Computers, analogue, Anacom, new techniques in, 2255
for design problems of mechanical structures, 1023
differential analyser, with ball-and-disk type of integrator, 1649
for generating polynomials and finding their zeros, 1025
guided-missile, step multiplier for, 234
limits of accuracy of, 1947
multiplier circuit for, 1652
quarter-square multiplier for, 1022
resistance-network, for waveguide and cavity-resonator problems, 2839
sampling, 2546
small-scale, 1024
for solution of systems of linear equations, new construction principle for, 2256, 3484
for solving 3-dimensional electrical potential problems, 1858, (D)2257
for wave-equation boundary-value problems, 2254
analogue and digital, basic principles of, 1651
for correlation functions, 2547
digital, American, modern, 3483
automatic, operation and uses of, 1948
[illegible]
c.r.-tube storage system for, 1174
EDSAC, programme arrangement in, 1650
EDVAC, adding and counting circuits for, 1357, time-reference unit for, 434
electronic, simple, 2253
magnetic storage system for, ferromagnetic-core type, 2258, 3156, Ni-coated drum type, 2840
magnetostrictive storage system for, 1200
at Manchester University, 184
serial computing circuits for, 2838
electrical, various, 235
e.s. storage devices for, use of $BaTiO_3$ ceramic in, 752
multistable magnetic storage devices for, 1949
Conduction, electrical, theory of, 1576
in metals, size-effect in, 649, 2191
theory of, 2190
Conductivity, of gases containing free electrons, 1266
h.f., of ionized air, 382
of monovalent metals, theory of, 2488
Conductors, wire, steady-temperature distribution on, 375
Conferences, automatic control, Cranfield, July 1951, 1061, 2293; British contribution to television, 1952, 2629, 2633; C.C.I.F., Florence, 1951, 2328; C.C.I.R., Geneva, 1951, television, 2060; Electrical Engineering Commission for U.D.C., Rome, 1951, 2958; electron microscopy, Hamburg, 1951, 228; Philadelphia, Nov. 1951, 2306; Philadelphia and Washington, 1951, 3206, St. Andrews, June 1951, 1702, 2305, Tübingen, 1952, 3205; European broadcasting, Stockholm, 1952, 3560; Extraordinary Administrative Radio Conference, Geneva, 1951, 2599, 3550; I.R.E., u.h.f. symposium, Philadelphia, 1951, 1793, 1952 National Convention, New York, 2096; I.R.E.-U.R.S.I., 1951 Fall meeting, Ithaca, N.Y., 1485, Spring meeting, Washington, 1952, 2961; International Union of Geodesy and Geophysics, Brussels, 1951, 1598, Oslo, 1948, 869; luminescence and applications, Moscow, 1951, 3108; maintenance of standards, National Physical Laboratory, May 1951, 2362; physics of electrical discharge, Swansea, 1951, 99; radio navigation, Hamburg, March 1952, 3093; soft magnetic materials in

telecommunications, London, 1952, **3121**; television, Berlin, 1952, **3246**; ultrasonics, Brussels, 1951, **7**
Contact potential, measurement of, **1885, 3164**
survey of, **1263**
variations in freshly condensed metal films, **1886**
—— **resistance,** of SiC crystals, theory of, **3133**
Contacts, arcing on closure of, **665**
chains of, algebra of, **2128**
electrical, materials for, **3146**
Control, (See also Electronic applications; Frequency control; Servomechanisms; Telecontrol)
application of differentiating circuits in, **1688**
automatic, of inaccessible-terminal voltages, **1062**
of power supplied to electric heater, **3561**
equipment, for German post office broadcasting-network repeater stations, **1726**
process, electrical system for, **1386**
radio, of model aircraft, **2309**
technique, electrical, symposium of papers on, **3192**
—— **systems,** closed-loop, logarithmic-plotting technique for design of, **2039**
combined open-cycle and closed-cycle, **810**
electro-analogue for study of, **456**
stability of, **2619**
synthesis by root-locus method, **2337**
Converters, (See also Frequency converters)
d.c./a.c., comparison of, **504**, **(C)**1119
Copper, Chilean, impurities in, **1021**
Cores, Mn-ferrite, loss angle of, **429**
powder, magnetic after-effect in, frequency dependence of, **1326**
and sheaths, magnetic, in telecommunications, **2246, 3479**
tape-wound, **3471**
Correlator, electronic, for reception in noise, **248**
Cosmic radiation, r.f., (See also Astronomy, radio; Noise, r.f.; Solar radiation, r.f.)
from Andromeda nebula, **1285**
from Cygnus region, **120, 1904, 2788**
extra-galactic, **2215**
from galaxy, origin of, **390**
review of, **1279**
at 18·3 Mc/s, **980**
at 255 Mc/s, **3423**
at 1·21 and 3 kMc/s, **1906**
at 1·42 kMc/s, from galactic H, **961,** and galactic rotation, **982**
at 25–110 Mc/s, 1948–1949 records of, **3421**
Counter tubes, cold-cathode, glow-discharge, Types G1/370 K and G10/240 E, **2933**
gas-filled, I.R.E. standard definitions of terms, 1952, **3207**
I.R.E. standards on methods of testing, 1952, **3208**
multicathode, **(A)2657, 2932**
Counters, crystal, diamond, **1398, 3526, 3527,** charge transport mechanism in, **769,** differences in, **2004,** space charge in, **231,** space-charge-free, **232**
G-M, Br-quenched, characteristics of, **767**
circular, construction of, **1079**
directive effect in, **464**
external-cathode, construction of, **1078**
factors affecting stability of, **465**
gas-filled, **3210**
for locating ionizing particles, **230**
non-self-quenching, slow discharge in, **766**
toroidal, **2571,** construction of, **768**
Xe-filled, **2003**
Xe/O-filled, **1399**
pulse, electronic and electromechanical, survey of, **928**
scintillation, characteristics of, **3528**
self-quenching, parallel-plate, **3525**
containing small amounts of polyatomic gas or vapour, **1704**
sub-unit system for nucleonics, **610**
windowless and end-window, sensitivities of, **1397**
Couplers, directional, arrays for superdirectivity, **(D)2990**
multi-element, **3380**
use in aerial-matching measurements, **2435**
Coupling, control, of oscillatory circuits, **356**
waveguide, by large apertures, **2473**
window, cm-λ applications of, **2158**
Crystals, BaO, growth of, **174**
lattice vibrations of, interaction of electrons with, **1575**
SiC, emission of light on passage of current through, **154**
Current, h.f., meters for, **1040**
Cybernetics, and applications, **233, 2005**
definitions of Plato and Ampere, **489**

D

Detection, of f.m. signals, **2590**
Detectors, a.m., characteristics of, **483**
coherent, and synchrodyne, **2883**
coherent and incoherent, comparison of, **(A)255, 795**
frequency, dynamic characteristics of, **484**
using frequency-dependent rectifiers, **282**
radiation and particle, in nucleonic instruments, **765**
ratio, limiting in, calculation of, **485,** theory of, **2016**
theory of and measurements on, **2324**
v.m., microwave, **2884**
Diamonds, as counters, differences in, **2004, 2308**
properties of, **1398, 3526,** for β-particles, **3527**
dielectric constant of, **3143**
effect of inhomogeneities on electrical properties of, **1640**
for particle counting, structure of, **3211**
Dielectric constant, and absorption coefficient, of gases, u.h.f. measurement of, **1368**
of air, and main constituents, at 24 kMc/s, **1371**
at λ 10 cm, **(D)1957**
at 3 kMc/s, **3127**
of BaO crystals, **157**
cavity-resonator measurement of, at cm λ, theory of, **442**
at 3 kMc/s, for solids, **1033**
coaxial-line measurement of, at 40 and 55 cm λ, **3492**
at m and dm λ, **1956**
determination from shorted-line measurements, charts for, **3166**
determination from waveguide measurements, abac for, **1367, 2270**
and dissipation factor, measurement of, **2268**
field dependence of, **1932**
of human blood, at u.h.f., **749**
of low-conductivity fluids, at cm λ, **1664**
measurement of, effect of reactance in λ/4 Lecher line on, **3491**
of mixtures, theory of, **3112**
of sea water, **3424**
of solvents, variation with temperature, **687**
of water and aqueous solutions, cm-λ measurements of, **1663**
of water vapour, at 9·28 and 24·8 kMc/s, **2269**
—— **loss,** determination from d.c. measurements, **2848**
h.f., and resonance absorption, **707**
measurement by cavity-resonator method, **1666, 3162**
in polar polymers, effect of orientation on, **3113**
—— **properties,** c.r.o. method for investigation of, **441**
of highly absorbing dielectrics, measurement by 'infinite layer' method, **1370**
of human tissue, at microwave frequencies, **1385**
of ice and snow, at 3·2-cm λ, **3494**
measurement during h.f. heating, **(A)1032**
of solids, temperature variation of, **191**
of substances containing straight polar chains, **2272**
of TiO$_2$, **1345**
of water and methyl and ethyl alcohols at u.h.f., **3399, 3400**
of water in water-dioxan mixtures, at microwave frequencies, **695**
Dielectrics, artificial, effect of magnetic field on propagation of e.m. waves in, **1587**
isotropic, theory and properties of, **2523**
for microwave lenses, design techniques for, **2423**
strip-loaded, for microwave lenses, measurements on, **727**
Diffraction, (See also Sound)
acoustic, aperture transmission cross-section for oblique incidence, **2686**
by circular apertures, **304**
by sphere, and reciprocity theorem, **2676**
of cm waves, by cylinders, **2186**
of cylindrical e.m. waves, by circular aperture, **2771**
of e.m. pulse, by wedge, **3056**
of e.m. waves, by aperture in plane conducting screen, **1583, 2184**
near earth's surface, **238**
and Huyghens' principle, **2487**
by perfectly reflecting wedge, **374**
by plane screens, and application to microwave lenses, **970**
by semi-infinite metal sheet, **3418**
by semi-infinite plane screen, **969**
by straight slit, **2183**
by waveguide of finite length, **2185**
by wire gratings, **3057**
of light by semitransparent sheet, **1883**
of plane e.m. waves by circular disk or aperture, **968**
of plane sound pulse by grating, **2415**
of radio waves, in passage through phase-changing ionosphere, **1284**
patterns near receiving aerials, **(D)2187**
rigorous formulation of classical problem of, **2182**
of sound pulse by wedge, **2966**
of sound waves at uneven surface, **1181**
Dimensions, of electrical and magnetic quantities, **2775**
Direction finders, Adcock, H-type, polarization errors in, **2812,** for m and dm waves, **598, (A)1521**
s.w., recent developments in, **2519**
for aircraft, calibration of, **143, (C)997**
cm-wave, **998**
polarization errors of, classification of, **142**
for ships, comparison of frame coils and stretched-wire loops for, **2517**
requirements for and developments in, **2516**
Telegon, **139**
goniometer for, **140**
u.s.w., Type PV-1B, at Kloten airport, **141**
—— **finding,** angle measurement in, **3092**
methods of, review of, **138**
Discharge, (See also Breakdown)
arc, gas, theory of, **3066, 3067**
high-current, effect of self-magnetic field in, **100, 1889**
hot-cathode, discharge modes for, **959,** anode-glow mode of, **3068**
electrodeless, in ionized gas in travelling magnetic field, **2195**
gas, d.c., current fluctuations in, **1891**
electron-temperature determination for, **1465**
low-pressure, r.f. noise in, **3064**
mechanism of positive-ion collection by spherical probe in, **957**
potential field of, **103**
u.h.f. excitation of, **1887**
as u.h.f. noise source, **185**
h.f., breakdown mechanism of and similarity relation for, **378**
similarity relation for minimum maintenance potentials, **379**
Hg-vapour, low-pressure, dielectric constant and electron density in, **651,** l.f. noise spectra of, **2942**
ion-surge, and arc-back in Hg-vapour rectifiers, **380**
spark, wide-gap, in air, mechanism of, **3403**
Townsend, pulsed, electron-emission processes in, **960,** transient currents in, **101, 958**
—— **tube,** (See also Valves)
gas, plasmatron, **873, 2659**
plasmatron and others, **872**
glow, cold-cathode, **2071**
voltage-regulator, characteristics of, **1772**
Discriminators, for f.m. beam links, distortion in, **2329**
including null networks, general theory of, **1416**
pulse-counting, for f.m. monitoring, **3589**
u.h.f., and use for frequency stabilization of klystron, **59**
Distortion, in beat-frequency oscillators, **1552**
in coils with ferromagnetic cores, **2454**
in discriminators used in f.m. radio links, **2329**
echo, of f.m. and a.m. signals, **2890**
in f.m. multiplex R/T, **2022**
envelope-delay, c.r.o. display and measurement of, **2286**
in f.m. systems, due to aerial-feeder mismatch, **2602**
due to small loss and phase variations, **2027**
low-frequency, due to h.f. phase shift, **2881**
of N-shaped pulses in RC amplifiers, **2484**
needle-drag, in gramophone reproduction, **2423**
nonlinear, in push-pull class-B amplifiers with choke output, **90**
in output of negative-feedback amplifiers, **95**
in p.c.m. systems, analysis of, **2332**
and background noise, **2331**
pulse, in f.m. systems, **1215**
in linear systems, **55, 619**
in RC and LG lines, **578**
reduction by amplitude limiting, analysis of, **193**
second- and third-harmonic, in transmission of music, **3322**
signal, by directive broadcasting aerials, **2600**
of signals transmitted by homogeneous coaxial line, **1194, (C)3336**
spatial, acoustic, applications of concept of, **3300**
third-harmonic, in ring modulator, **1874**
Dynamos, amplifying, use in servomechanisms, **2620, 3240**

E

Ear, (See also Hearing)
cochlear partition, d.c. potentials and energy balance of, **307**
nonlinear characteristics of, **10**
Earths, lightning-protection, value of h.f. measurements on, **3165**
Eddy currents, in cores with nonuniform permeability, **3122**
due to domain-boundary displacement, **3115**
Electrets, thermal conductivity of, **3443**
Electric field, in semi-infinite slot with semicircular end, **3071**
Electrical properties, of non-metals, effect of electron mean-free-path on, **1577**
—— **quantities,** and mechanical quantities, analogies between, **2178**
Electroacoustics, definitions of terms, 51 IRE 6 SI standard on, **(C)883**
Electroluminescence, in anodic polishing of Zn, **3055**
theory and applications of, **647**
Electrolyte tank, with automatic recording, **3179**
current lines in, automatic tracer for determination of, **2283**
for study of magnetic fields of iron-clad current sheets, **2284**
use in design of filters, **622**
Electromagnetic field, of helix, **1580**
microwave, c.r.o. plotter for, **448**
inside spherical envelope with nonuniform permittivity, **3415**
—— **theory,** asymptotic solution of Maxwell's equations, **646**
boundary-value problems and Wiener-Hopf techniques, **1572**
energy density and flux, comparison of Poynting's and Macdonald's theorems, **2776**
field representations in spherically stratified regions, **663**
radiation capacitance, **1894**
—— **universe,** physics of, **2767**
Electromagnetism, classical theory of point charge, **2188**
new theory of, **2201**
Electrometers, leaf-type, mechanically astatized, **3177**
vibrating-capacitor, **3500**
Electron beams, axially symmetrical, in magnetic fields, theory of, **2865**
converging, elimination of space-charge effects by magnetic field, **1466**
cylindrical, space-charge-wave propagation in, **2371**
dispersion of, in gases, **3406**
equivalent temperature of, **(D)1780**
high-energy, radiation from, application of, **(C)966**
probabilities relating to, **3407**
in valves, current distribution in, **2072**
—— **density,** in ionized gas, microwave measurement of, **653**
—— **emission,** (See also Cathodes)
from cold Ni cathode oxidized by sparking, **98**
from metal in electric field, **1467**
secondary, comparison of theories of, **108**
from composite surfaces, **2198**
fundamentals of, **656**
from insulator in equilibrium with space charge and constant-potential enclosure, **2364**
from liquid metal surfaces, **109**
from metals, theory of, **107**
from Ni, angular distribution of, **1769**
from solids, theory of, **3069**
theory of, **2197**
Wooldridge's theory of, **110, 3409**
thermionic, of ceria, **2196**
efficiency of, **2650**
equation for, **1892**
from ferromagnetic materials, anomalous temperature variation of, **3070**
thermionic constants of graphite, **3467**
—— **guns,** for straight beam, **1171**
3-element, theory of, **2087, 2944**
—— **lenses,** determination of axial field of, **2298**
e.s., dioptrics of, **227**
elliptical, theory for transgaussian conditions, **1391**
formed by two coaxial cylinders, **1393, 2302**
formulae for third-order aberrations in, **460**
graphical determination of electron paths in, **462**
with grids, axial potential of, **1696,** Gaussian elements of, **1697**
independent, with minimum elliptical astigmatism, **1390,** third-order rays in, **2001**
low-power, theory of, **1389**
nearly symmetrical, theory of, **1072**
rigorous calculation of, **1698**
symmetrical, field distribution in, **1396**
as velocity filters, **461**
3-electrode, axial potential of, **2865,** potential model for study of, **2000,** trajectories in, approximation method for, **2299**
highly convergent, approximation method for trajectories in, **3202**
immersion objective, emission current in, **3520**
magnetic, aberrations due to asymmetry of, **1074**
analogous to optical plano-concave lens, **1395**
axial field pattern of, **195**
electron-microscope-objective, with minimum chromatic aberration, **2570,** with minimum spherical aberration, **1703**
electron-velocity analysis with, **1700**
image-forming properties of series of, **1701**
projector, for electron microscope, **2569**
study of, by W.K.B. method, **3203**
third-order aberrations of, **228**
mathematical model of, **1394, 2300**
cardinal parameters of, **2301**
numerical ray-tracing in, **2303**
optimum focusing in, **463**
paraxial constants of, derivation of, **3519**
spherical aberration of, correction of, **763**
test for, **1075**
useful formulae for, **1392**
—— **microscope,** at Calcutta, study of illuminating system of, **1073**
effect of specimen charging in, **3522**
hot-cathode guns for, characteristics of, **2304**
magnetic, resolution and magnification limit of, **459**
reliability of internal standards for calibration of, **3521**
Type EM4, 55-kV, **764**
velocity filters for, **3204**
—— **microscopy,** inorganic-replica technique in, **1071**
ion image of emissive anode, **1695**
technique for examining identical areas with electron and optical microscope, **3523**
—— **mirror,** equation for trajectories in, **2307**
—— **motion,** in periodic e.s. field, effect of magnetic field on, **1588**
—— **multipliers,** (See also Photocells)
with Al$_2$O$_3$Cs emitters, **1160**
research on, **2388, 3602**
—— **optics,** application of Newton's law of image formation in, **1699**
application of perturbation functions in, **1997**
of e.s. systems with rectangular and elliptical apertures, **1076**
properties of magnetic deflection fields, **1999**
refractive index in, **(D)1998**
—— **oscillations,** excitation in shock wave, and solar r f. radiation, **1900**
—— **plasma.** See Plasma.
—— **streams,** coupled to circuits, waves in, **106**
oscillations in, **654**
—— **trajectories,** automatic tracer for, **2852**
Electronic applications, (See also Control; Heating)
alarm systems, **218**; automatic timer for bullet photography, **1384**; colour matcher, **219**; control of rate of watches or clocks, **3195**; c.r.o. engine indicator Mark 6, **754**; crack detector for gun barrels, **454**; fatigue-testing equipment, **750**; furnace temperature control by thermistors, **2291**; judgment box, **217**; liquid-level gauge, **3188**; measurement of ignition delay in i.c. engines, **224**; metal detectors, design of, **1065**; photostimulator for clinical use, **225**; pulse-counter tachometer, **2289**; soldering-temperature control, **772**; vibrating-plate viscometer, **1686**
Electrons, and crystal-lattice vibrations, interaction of, **1575**
free paths in crystals, and related effects, **3408**
and ions, recombination of, mechanism of, **658, 962**
new classical theory of, **1574, 3059, (D)2202**
and existence of aether, **1573, (D)2203, (D)2769**
reflection by metallic crystals, **961**
Electrostatics, and magnetostatics, general solutions of equations of, **1262**
Electrostriction, in ferroelectric ceramics, **2819**
theory of, **3446**
Exhibitions, applied electronics, Manchester, 1951, **758**; British Instrument Industries, London, 1951, **1794**; components, Paris, 1952, **2154**; components, R.E.C.M.F., 1952, **2153**; electronic instruments and equipment, Manchester, 1952, **3623**; German Industries, Berlin, 1951, **1442**; I.R.E. 1952, a.f. equipment at, **2699**; Paris Fair, 1951, **791,** 1952, **3220**; Physical Society, 1952, **2401**; Society of British Aircraft Constructors, 1951, **1178**; television, Paris, 1951, **1138**; Vienna Spring Fair, 1951, **250**; 5th annual R.S.G.B. amateur-radio, **2402**; 18th National Radio, London, 1951, **292, 561**; 19th National Radio, London, 1952, **3577**; 19th Salon International de l'Aéronautique, Paris, 1951, **2097**; 26th International Fair, Brussels, 1952, **3297**
Experiments, principles of design and analysis of, **437**

F

Facsimile, broadcast, multiplex, **512**
wire system, Zürich, **818**
Faraday effect, correlation with Kerr effect, **1275**
in ferrites at u.h.f., and microwave gyrator, **1238**
for guided microwaves, **2710**
Feedback, negative, analysis of, **3051**
C.F.T.H. applications of, **3580**
current and voltage, exact equations for, **388**
voltage, parallel, **94**
Ferroelectric materials, BaTiO$_3$, ceramics, factors influencing dielectric properties of, **2244**
crystals, h.f. dielectric constant of, **156**
effective fields in, **3137**
explanation of properties of, **1340**
piezoelectric properties of, **1624**
powdered, **2243**
single crystals, detwinning of, **974,** 120°C transition of, **1948**
theory of, **1341**
BaTiO$_3$-type crystals, effect of elastic stress on, **3445**
thermodynamic theory of, **3444**
ceramics, electrostriction in, **2819**
moulded Rochelle-salt, **1639**
Ferroelectricity, origin of, **155**
Ferromagnetic materials, (See also Alloys)
alloys, Alcomax, torque curves and magnetic properties of, **426**
alnico-5, magnetic structure of, **3456,** physical structure and magnetic anisotropy of, **2530, 2531**
Ni, linear magnetostriction of, **1331,** magnetostriction and magnetic properties of, **3458,** temperature variation of spontaneous magnetization of, **1880**
Ni/Fe wire, determination of complex permeability at v.h.f., **1667**

    permalloy, skin effect in, **3119**
    permalloy F, properties of, **3455**
    permanent-magnet, effect of heat treatment on magnetic viscosity of, **3463**, properties of, **2536**
    perminvar, domain structure of, **2532**
    Si-Fe, differences between similarly treated specimens of, **1631**, effect of heat treatment in magnetic field, **692**, magnetic properties of, **3464**
    supermalloy, resistance anomalies in, **691**
  eddy currents due to displacement of domain boundaries in, **3115**
  ferrites, antiferromagnetic arrangements in, **3414**
    Co, resonance at high temperature, **1327**
    dielectric investigations on, **3459**
    h.f. dielectric and magnetic properties of, **690**
    magnetization process in, **1633**
    as magnetostrictive resonators and as filter elements, **624**
    Ni and Co, low-frequency dispersion in, **1328**
    Ni/Zn, dispersion of resistivity and dielectric constant of, **162**, r.f. magnetic spectra of, **3465**
    oriented while hot, magnetostriction of, **2534**
    permittivity and permeability at 6·6-cm λ, **2535**
    rare-earth, with two Curie points, **3457**
    review of theory of, **168**
    Si, crystal-structure imperfections in, **2533**
    uses in waveguide-aerial systems, **2721**
  ferroxcube, applications of, **3124**
    properties of, **2823**
  ferroxdure, properties of, **3460**
    properties and applications of, **2534**
  high-coercivity, high-μ, low-loss, new, review of, **3118**
    in weak fields, magnetization of, **3117**
  hysteresis loss in, two-fluxmeter method of measurement of, **2274**
  macroscopic magnetic texture of, **427**
  metals, temperature dependence of magnetic viscosity of, **1333**
  mumetal thin strip, measurements in steady and alternating magnetic fields, **3123**
    temperature variations of, **2529**
  Ni, Bitter patterns on single crystal of, **701**
    field dependence of elastic constants of, **887**
  powders, dependence of properties on density of packing, **3116**
    iron-oxide, magnetic properties of, **2528**
    properties at frequencies up to 24 kMc/s, **2236**
    semioxidized Fe and Fe-Co, properties of, **1935**
  soft, for electrical instruments, characteristics of, **1942**
  thermionic emission from, anomalous temperature variation of, **3070**
—— **resonance**, and complex-permeability diagram, **1278**
  and internal field, analysis of, **1632**
Ferromagnetism, and antiferromagnetism, molecular-field treatment of, **3413**
  laws of, **167**
  in spinels, and interatomic distances, **1347**
Field strength, (See also Television; Wave propagation, e.m.)
  e.m., microwave, in ionized gas, measurement of, **3489**
  meter for 75–195 Mc/s, **1662**
  records of, interpretation of, **3219**
    for 410 Mc/s, statistical analysis of, **784**
  service range for aircraft communications at frequencies > 50 Mc/s, [illegible]
  survey for Wrotham 90-Mc/s transmitter, **240**
  v.h.f., prediction method for mountainous terrain, **2584**
    standards of, (**A**)**2553**
Films, (See also Sound recording; Sound reproduction)
  thin, Ag, resistivity variation with thickness and temperature, **693**, **694**, sputtered, structure of, **2239**
    Ag and Al, effect of electric field on development of, **2826**
    Ag, Al and Si, electrical properties of, **2537**
    Au, influence of support on crystallization of, **172**
    carbon, conductivity of, **171**, **2827**
    Fe, resistance variation with current at low temperatures, **2828**, resistivity measurements on, **2238**
    glass, conductivity and breakdown strength of, **2833**
    insulating, in contacts, tunnel effect across, (**C**)**1017**
    luminescent, transparent, **685**
    metal, conduction in, mechanism of, **876**, freshly condensed, contact-potential variations of, **1886**, temperature and voltage variation of, **1634**, variation of resistance with applied potential, **2192**
    PbTe, infrared photoconductivity of, **860**, **861**
    polymer-dielectric, noise in, **3478**
    Pt, on evaporated dielectric layers, resistivity of, **3126**
    semiconducting Sb, photoconductive properties of, **2522**
    Se, photoconductivity of, **3104**
    Si, conductivity of, **3451**
    TiO_2, insulating, resistance of, **3114**
    ZnO, conductivity variations with electron irradiation, **3470**, energy conversion in irradiation with light or electron beams, **3469**, evaporated, measurements of Hall effect in, **2825**, evaporated, photoconductivity of, **3468**
    ZnS, electron-bombardment-induced conductivity of, **1630**
Filter-transformer unit, miniature, design of, **2749**
Filters, (See also Networks)
  a.f., heterodyne, **1864**
  analysis and design of, using straight-line representation of characteristics, **1546**, (**D**)**2751**
  band-pass, bridge-type, using magnetostrictive ferrite elements, **694**
    cavity, for cm waves, **2149**
    construction from basic circuits, **2748**
    h.f., with *n* coupled circuits, **2753**
    with maximum bandwidth, use of tuned transformers in, **1863**
    mechanical, 100-kc/s, **2752**
    narrow-band, crystal, **354**, electromechanical, **3034**
    waveguide, **3346**, tunable, **353**, **1834**
    2-stage, charts and tables for parameters of, **1236**
    4-circuit, and bandwidth switching, **69**
  bridge-type, quartz, mode of operation of, **3035**
  choke, transformer properties of, **1234**
  crystal, complementary high-pass and low-pass, for 24-channel carrier system, **71**
  and delay lines, equalized, design of, **3029**
  design of, modification of conventional method of, **1862**
  frequency response of, measurement of, **2847**
  with generalized parameters, calculation of, **1545**
  ideal, generalized, investigation using function-space techniques, **2147**
  ladder, without attenuation fluctuations in pass band, **1543**
    composite, design of, **1544**
  lattice, crystal, design of, **3033**, maximum bandwidth of, **1235**
  linear, variable, theory of, **2464**
  low-pass, T- and Π-type, for measurement equipment, **352**
  microwave, using multimode cavity resonators, **625**
  multiple-resonant-circuit, alignment of, **627**, **3038**
  with phase distortion, theory of transmission time and build-up time in, **2465**
  RC, double-T, theory and applications of, **2148**
    multisection, theory of, **623**
    polyphase, synthesis of, **3037**
  symmetrical and antimetrical, characteristic functions and attenuation calculation for, **3377**
  Tchebycheff-type, h.f., and amplifier networks, **88**, (**C**)**2179**
    low-pass, and amplifier networks, **1541**
  theory of, introduction to, **2747**
    use of transform methods in, **2750**
  time and frequency phase responses of, redundant information in, **3378**
  use of electrolyte tank for design of, **622**
  vestigial-sideband, for Sutton Coldfield television transmitter, **636**
Fluxmeter, recording, with high accuracy and sensitivity, **3174**
Frequency, (See also Analysers; Analysis; Standard frequency)
  allocation, international, for broadcasting, principles of, **3227**
  changers, using frequency-dependent rectifiers, **283**
    microwave, travelling-wave valves as, **1463**
  comparator, **1679**
    recording, **3172**
  comparison, of nearly equal frequencies, **1979**
  control, 'master and slave' system for radio link, **1782**
    automatic system, narrow-band, transient response of, **606**
  converters, as quasilinear quadripoles, **2166**
    u.s.w., for relay station, **2646**
    wide-band, for signal generator, **1383**
  dividers, balanced-modulator type, modification of, **3384**
    decade, multivibrator design for, **1557**
    locked-oscillator, **944**
  division and multiplication, **633**
  measurement, by capacitor-charge method, **732**, **2272**
    L.N.R. department for, organization and equipment of, **3159**
    in microwave range, **3173**
    r.f., self-interpolating crystal calibrator for, **1964**
  meter, direct-reading, for 30 c/s–30 Mc/s, **743**, **2855**
    primary-standard, U.S. Navy, **1378**
  multiplication, high-power, at v.h.f. and u.h.f., use of tetrodes for, **3048**
    by means of relativistic effects, possibility of, **3383**
  multipliers, with selective grid circuit, **84**
  negative, and Fourier analysis, **1422**, (**D**)**1720**
  spectrum, of a.m. and f.m. signals, demonstration equipment for, **443**
    of f.m. wave, and Bessel functions, **2892**, (**C**)**3554**
  stabilization, (See also Stabilization, frequency)
    of klystron by u.h.f. discriminator, **59**
    by microwave absorption, **1850**
  standards, microwave, **1951**
    1-kc/s, synchronized by pendulum chronometer, **2262**
Furnaces, electric, review of, **1387**

G

Galactic radiation, r.f. (See Cosmic radiation, r.f.)
Galvanometers, and amplifiers, Brownian fluctuations in, **2280**
  integrating, **3176**
  moving-coil, applications in biological physics, **2282**
    for measurement of mean charging current of periodically discharged capacitor, **2281**
  vibration, using piezoelectric oscillator, **2851**
Generators, (See also Oscillators; Signal generators; Sound)
  acoustic, air-jet, synchronization of, **299**, for producing waves in liquids, **300**
  complex-waveform, **3498**
  e.s., h.v., charged-mercury-drop, **2047**, rotary, small, **274**, 1-MV, using glass-dust stream, **3517**
  frequency-sweep, 470–890 Mc/s, with crystal calibrator, **2285**
  harmonic, u.h.f., using Ge diodes, **636**
    using iron-cored reactor, (**A**)**812**
  h.f., with RC-line for frequency variation control unit, **3045**
  magnetostrictive, ferrite, **1801**
  for measurements at u.h.f., **2862**
  noise, microwave, calibrated, portable, **1986**
    Type 1390-A, **1987**
    0–25 c/s, **1030**
    1 c/s–20 kc/s, **721**
  pulse, cathode-coupled, **1244**
    high-power, with controlled spark-gap, **612**
    h.v., controlled tripping of, **611**
    using multivibrators and delay networks, **1871**
    for producing strong magnetic fields, **759**
    using saturable reactors, (**D**)**2450**
    square-wave, using Hg relay tube, **2479**, 2-channel, **1873**
    for variable-width pulses, **635**
    3-valve, with fixed repetition rate, **1554**
    0·1-μs, with repetition frequency 0·2 to 4·9 × 10^4/sec, **1683**
  sawtooth-wave, **2165**
    using transformation of sine waves, **1872**
  sonic and ultrasonic, commercial, review of, **2679**
  stepped-pulse, for television testing, **1684**
  tone, for electronic organ, **905**
  u.h.f., secondary-standard, of Compagnie Générale de T.S.F., **1377**
  ultrasonic, and applications, survey of, **1182**
    high-power, construction of, **4**
    industrial, economical, **2965**
    low-power, **5**
    magnetostrictive, linear, using crossed magnetic fields, **3308**
    siren, high-power, **1496**
  warble-tone, optimum frequency and sweep in, **3317**
Geomagnetic storms, and ionospheric storms, **395**
  and solar coronal region of intense radio emission, **2213**
  theory of first phase of, **2504**
  April–June 1951, **127**, April–Sept. 1951, **1288**, July–Dec. 1951, **2505**, Oct. 1951–March 1952, **2791**
Geomagnetism, and its changes, **2499**
  disturbances, and atmospheric pressure, **3428**
    international data, first quarter 1951, **124**, second quarter 1951, **1286**, third quarter 1951, **2501**, fourth quarter 1951, **2792**
    21st Sept. 1951, observations of very rapid pulsations during, **1910**
  field variations, anomalous, at Kodaikanal, **2503**, and winds in ionosphere, **1909**
    with depth, **1596**
    diurnal, abnormal, and equatorial electrojet, **1597**, interpretation of, **670**
    and earth's rotation, **126**
    secular, analysis of, **671**
    during solar eclipse, 25th Feb. 1952, **3425**
    world-wide, and relation to sudden commencements, **1908**
  K-indices at Abinger, Eskdalemuir and Lerwick, Jan.–July 1951, **391**, Aug.–Dec. 1951, **1907**, Jan.–March 1952, **2789**, April–June 1952, **3078**
    Cheltenham, April–June 1951, **125**, July–Sept. 1951, **1287**, Oct.–Dec. 1951, **2502**, Jan.–March 1952, **2790**
  occurrence of bays, and relation to ionosphere winds, **1603**
  and solar emission of corpuscles, **2494**
  solar-flare effects on, **2500**
    1936–1949, **389**
  vertical field, over the Sound (Sweden), **123**
  11-year variations of H, interpretation of, **2216**
Geophysical data, determination of lunar daily variations of, probable error of, (**D**)**2801**
Geophysics, and e.m. theory, **1595**
Ground, conductivity of, **433**

H

Harmonics, mains-voltage, meter for, **731**
Hearing, (See also Ear)
  aids, components of, testing of, **1193**
    measurements on, **903**
    Medresco, **2111**
    using piezoelectric transducers, **16**
    and test methods for, standardization of, **3335**
    testing of, **904**
    trends in design and technique of, **2963**
  audiometer measurement of loss of, **2101**
  frequency-compression properties of the ear, **1560**
  and phonation, relations between, **1184**
  physical processes in ear, **2100**
  recovery of threshold after exposure to intense sounds, **2418**
  stereophonic, physiological factors in, **1186**
  threshold anomalies in relation to equal-loudness contours, **2692**
Heating, combined dielectric and platten, temperature distribution in, **2564**
  h.f., dielectric, magnetrons and associated circuits for, **556**
    dielectric and induction, economics and applications of, **457**, efficiency and applications of, **756**, equipment for, and methods and applications of, **3194**, fundamentals of, **215**, industrial applications of, **755**, life of valves used in, **757**
    induction, control system for, **1064**, equipment for surface hardening, **3193**, generalized theory of, **216**
  m.f., induction, in drop-forging industry, **1893**
High-voltage generators. See Generators.
High voltages, alternating, measurement with capacitive voltage dividers, **440**, **2845**

I

Icing, experimental investigation of, **1589**
  in supercooled mists, electrical effect in, **677**
Ignitrons, time lag of, **1746**
Image converters, and applications, **2864**
  with concentric-sphere electrode system, **3284**
  as high-speed shutters in photography, **1400**, **1693**
Impedance, (See also Acoustics; Aerials; Networks; Transmission lines)
  acoustic, definitions of, **298**
    of porous materials, Beranek's theory of, **2695**
  characteristic, of coaxial cable, frequency-sweep measurement of, **3368**
    of free space, **3419**
  matcher, automatic, **1224**
  matching, of balanced transmitters to unbalanced transmission lines, **1887**
    high-impedance shorted stubs for, parameters of, **1855**
    methods of calculation for, **2141**
    for power amplifier and load, simplified design methods for, **1857**
    of travelling-wave valve Type M8 to waveguide, **2940**
    of travelling-wave valves Types M8 and M11 to coaxial lines, **2939**
  measurement, h.f., using bridged-T and parallel-T elements, **1665**
  meter, frequency-sweep, for 3–3·4 cm λ, **1673**
    for 0·05–2 kMc/s, **445**
  standards, coaxial, **186**
  vector, frequency-sweep measurement of, **728**
Impedor, waveguide, variable, using multihole coupling, **2150**
Inductance, mutual, of wire and portion of parallel conducting plate, **1581**
Induction, current, in conducting ribbon due to incident plane e.m. wave, (**A**)**2441**, **2723**
  electromagnetic and magnetoelectric, **2204**
Inductors, (See also Coils)
  as filters for radio-interference elimination, design of, **3019**
Instruments, electrical, aspects of design of, **1968**
    new principles in, **1966**
    performance limits of, **1971**
    properties of insulating materials for, **1940**
  electronic, for chemical laboratories, **2565**, **2863**
  for microwave measurements, **1969**
  modern methods of presentation of readings of, **1970**
  radiation-measurement, for infrared to ultraviolet waveband, **1991**
    for X-rays to cosmic rays, **1989**
  recording, self-balancing, for atomic-energy applications, **1037**
Insulating materials, (See also Ferroelectric materials)
  $BaTiO_3$, ceramics, effects of firing temperature on properties of, **1941**
    irreversible processes at low temperature in, **2245**
  ceramics, pyrophyllite, **1016**
  crystal, absorption of light in, **2181**
    electronic conduction in, **3475**
  dielectric properties of, **177**
  for electrical instruments, properties of, **1940**
  fibreglass, manufacture and applications of, **3477**
  glass, breakdown and conductivity of, **1348**
    dielectric losses in, **3476**
    manufacture of, technical control in, **1351**
    tellurite, properties of, **2834**
  hexagonal-$BaTiO_3$, Lorentz correction in, **173**
  mica, synthetic preparation and properties of, **3149**
  mica paper, production and properties of, **3148**
  organic polymers, deterioration of, **1020**
  $PbZrO_3$, antiferroelectric structure of, **1018**
    piezoelectric effect in, **1019**
  plastics, review of, **1349**
  polymers, ultrasonic investigation of mechanical properties of, **1317**
  silicone rubber, properties of, **1644**
  solid, mechanism of charge in, **3058**
  tantalates and niobates, properties of, **3111**
  titanate ceramics, properties of, **708**
Intercommunication, in aircraft, a.f. problems of, **1187**
  systems, using loudspeakers as microphones, acoustics of, **1820**
Interference, in broadcasting reception, from industrial equipment, French regulations for prevention of, **3223**
  in f.m. reception, due to strong unwanted stations, **2886**, suppression of, **1421**
  in f.m. and a.m. reception, due to weak unwanted transmitters, **2325**
  from h.v. lines, investigation of, **257**
  impulse, suppression by gradient limiting, **2020**
  internal, in television receivers, **1143**
  in radio receivers from television receivers, suppression of, **2021**
  technique for measurement of, **1029**
  in television, from r.f. heating installations, suppression of, **1144**, **1459**
  in u.h.f. television receivers with crystal mixers, **2642**
  whistle elimination in superheterodyne receivers, **487**
Interferometer, electron-beam, basic principles of, **2562**
  radio, and use for observation of weak radio stars, **2497**
  ultrasonic, fixed-path, theory of, **1808**
    recording, **1809**, and applications, **1807**
Intermodulation, measurement and analysis of, **336**
Ion microscopes, field-emission type, **2866**
—— **source**, thermal, for negative ions, **1268**
Ionization, and luminescence, of rocket exhaust gases, **657**, **1269**
  thermal, of trapped electrons, theory of, **3449**
Ionosphere, (See also Absorption; Atmosphere; Wave propagation, e.m.)
  currents in, and 11-year variations of earth's magnetic field, **2216**
  D layer, theory of formation and structure of, **132**, (**D**)**2508**
  D and E layers, electron distribution and s.w. absorption in, **1300**
  disturbance observed in Adélie Land, 2nd–5th Feb. 1950, **1293**
  E layer, absorption of solar energy by oxygen molecules in, **986**
    characteristics of, **133**, **1601**
    theory of ionization of, **1915**
  E and F layers, determination of collision frequencies in, **987**
  E_s clouds, echo method for study of, **3080**
    and v.h.f. propagation, **1084**
  E_s layer, electron-collision frequency in, **398**
    ionization at high latitudes, association with aurora, **2511**
    movements of, 16th–17th June 1949, **2509**, 17th–18th June 1949, **1914**
    and turbulence in upper atmosphere, **1912**
  effects of solar eclipse at sunrise, 1st Sept. 1951, **2800**
  effects of solar flares on, **134**
    during 1936–1949, **389**
  effects of temperature variations on layer formation in, **401**
  F layer, ionization variations and abnormally high radio absorption in Canada, [illegible]
    in polar regions, winter thickness of, **676**
    winds in, radio-astronomical investigation of, **3082**
  F_2 layer, over Calcutta, solar tides in, **400**
    dependence of disturbances on local time, **2795**
    effect of vertical ion drift due to solar tides in, **2799**
    graphical representation of longitude effect in, **3081**
    half-year period in ionization and height of, **1602**
    height fluctuation of, **673**
    ionization in, 'isanomalies' of, **1296**
    lunar variations of f_oF_2 at Singapore, **2369**
    observations at Singapore, **969**
    recombination coefficient during occurrence of Mögel-Dellinger effect, 19th Nov. 1949, **1295**
    regularities in, **1294**
    storms in, and magnetic storms, **395**, statistics of, **2802**
  height of extra ionization during fade-outs on 2 Mc/s, **404**
  integrated conductivity of, **2500**
  irregularities, **130**
    plasma resonance in, **403**
  layer below E layer, theory of formation of, **2797**
  layer formation in, **128**
  long-delay echoes, search for, **3079**

  lower, fine structure of, (D)131
    negative-ion concentration in, 983, 2796
    nocturnal ionization disturbances in, 3426
    winds in, and geomagnetic variations, 1909
  lower layers, calculation of height from waveforms of atmospherics, 990
  luni-solar tidal effects in, 402
  magneto-ionic triple splitting in, 672, 1913
  observations near Adélie Land, 399
  physics of, 2217
  recording, spot-frequency method for, 1299
  recording stations in Austria and under French control, 1606
  reflection heights for 1·42-Mc/s waves, 3427
  reflection of short waves at heights less than 100 km, 2317
  review for 1951, 1605
  sounding, equipment for, 405, 1917
    at oblique incidence, 674
  sunset effects on broadcasting in tropics, 2320
  temperatures, critical survey of, 396
  thermal r.f. radiation from, 406
  tides in, 2510
  two layers below E layer postulated to explain 16-kc/s propagation phenomena, 2804
  virtual height of, calculations for specific ionospheric distributions, 2507
  virtual-height records, rapid analysis of, 1292
  winds in, and geomagnetic bays, 1603
    observation of, 1297, 1298
    radio measurement of, 1916
      at 80–100 km height, meteor-trail echo method for investigation of, 3083
  at 100 km height, temperature of, and absorption of solar ultraviolet radiation, 1290
Ions, gaseous, positive, motion in strong electric field, 97

L

Laboratories, frequency-measurement, L.N.R., organization and equipment of, 3159
Lenses, (See also Aerials; Electron lenses)
  microwave, artificial dielectrics for, design techniques for, 2123
    lattice, for cm waves, 3004, experimental results for, 3355
    path-length, E-plane radiation patterns of, 50
    properties of, 49
    strip-loaded pseudo-dielectrics for, measurements on, 727
  plastic, cast, for Schmidt large-screen projection systems, 1445
Light, repetitive-spark sources for shadow and schlieren photography, 1888
  velocity of, determination of, 2180, 3396, band-spectrum method for, 3053
Lightning arresters, function of, 509
    Resorbit, design of, 815
  detection by radar, 1614
  experimental research on, review of, 3088
  protection, for electrical systems, 508
    since Franklin's day, review of, 3244
    for l.v. systems, 507
  statistical study for Switzerland, 1925–1947, 3087
Loudspeakers, (See also Sound)
  arrays, radiation patterns of, 1822
  bass boost by resonator with phase inversion, 20, 2979
  cone diaphragms for, amplitude and phase measurements on, 312
  cone-type, diaphragm resonance in, 3326, 3327
    upper limiting frequency of, 3328
  diaphragms for, transformer analogues of, 1488
  direct-radiator, enclosures for, 1510
  duo-cone, acoustic coupling diaphragms of, 21
  electrodynamic, progress in development of, 19
  focusing baffle for, 2108
  ionic, Ionophone, 896, 898, 3329, physical principles of, 897
  low- and high-power, 2701
  radiator groups, 'universal', 573
Luminescence, of alkali sulphides and sulphates, 3110
  excitation by particles, recent research on, 3441

M

Magnetic fields, axially symmetric systems for production and measurement of, 964
  in conducting liquid, stability of, 122
  of conductors in slot, and application to transformer-reactance calculation, 602, 2448
  force and torque exerted on magnetized bodies in, 1270
  of iron-clad current sheets, electrolyte-tank method of study of, 2284
  of massive rotating bodies, theory of, 1594
  measurement of, 2555
  rotationally symmetrical, vector potential of, 111
  in semi-infinite slot with semicircular end, 3071
  and torque, for ellipsoid in external field, 1271
  travelling, interaction with ionized gases, 2195
—— flux, integrating amplifier for c.r.o. recording of, 2276
—— materials, (See also Alloys; Ferromagnetic materials)
  and domain theory of ferromagnetism, 689
  sulphides of Fe, properties of, 3139
—— properties, after-effect over total hysteresis range, 2237
  of metals, theory of, 2489, 2490
Magnetism, effect of torsion on longitudinally magnetized wire, 2491, 3417
  theory of diffusion after-effect, 3072
Magnetization, discontinuities in, mechanism of, 1272
  spontaneous, of Mg ferrite and Mg ferrite-aluminate powders at low temperatures, 3120
  of steels, in weak magnetic fields, 1332
Magnetometers, electronic, developments in, 1657
Magneto-optics, of electron gas with guided waves, 912, (C)913, 914
Magnetoresistance, anomalous, of Bi at low temperatures, 1629
Magnetostriction, of Fe/Si-alloy single crystals, 1012
  of ferrites oriented while hot, 2534
  linear, of Ni alloys, 1331
  of prolate spheroids, analysis of and experimental results on, 1929
  in rotating field, 384
Magnets, design of, use of current sheets in, 2247
  permanent, air-gap field of, 963
    determination of maximum air-gap field of, 3461
    determination of optimum working point of, 3462
    modern, and applications, 3152
    for spectrographs and nuclear physics research, 3480
    made of ultrafine iron powder, 3151
Manometer, differential, sensitive, 1022
Mathematics, algebraic equations, solution on EDSAC, 3155
  Bessel functions, simple method of evaluation of, 2892, (C)3554
  boundary-value problems, solution by means of elliptic partial differential equations, 3153
  differential equations, partial, various, solutions and tables for, 718
  eigenvalue problems, relaxation method for, 1353
  exponential integral and error function, approximate expressions for, 2252
  Fourier integral, series expansion of, 433
  functions, epicycloidal and Bessel, 1944
  Green's function, one-sided, properties and application of, 711
  Heaviside operators, time-dependent, 432
  impulse integral and Duhamel step integral, 1852
  integral $\int e^{b(x + a\cos x)}\,dx$, solution for, 431
  interpolation theorem and aleatory functions, 2837
  Laplace and Helmholtz equations, separability conditions for, 3482
  Laplace transformations and boundary-value problems, 712
  logarithmic-complex-number plane and complex-number calculator, 1355
  matrices, application in circuit theory, 68, 617, 936, 1228
    application to quadripole-network problems, 617
    for quadripole networks, transformation of, 68
  matrix theory, application to valve circuits, 2744
  methods for solution of potential-distribution problems, 182
  perturbation functions, and application in electron optics, 1997
  probability, generalization of random-walk problem, and Brownian motion, 3052
  quaternions, use in theory of chains of quadripoles, 3374
  relaxation methods in solution of boundary-value potential problems, 1357
  tensors, third and fourth orders, transformation of, 710
  transform methods, and filter theory, 2750
  vectors, probability distribution of phase of resultant of constant vector and Rayleigh-distribution vector, 2251
  wave vectors, theory and applications of, 2250
Measurements, (See also individual subjects)
  a.c., null indicators for, 1660
  apparatus, electrical, sensitivity of, 198
  h.f., survey of techniques for, 1954, 3163
  microwave, inductive probe for, 1958
  of voltage s.w.r., directional-coupler errors in, 582
Metallization, of surfaces by evaporation in vacuo, 1334
Meteors, plasma oscillations in trails, 655
  sporadic, velocity distribution of, 1899
  summer daytime streams of 1949 and 1950, 385, 386, 387
  trail echoes, characteristics of, 2493
    frequency dependence of duration of, 1592
    rate variation with radar-system parameters, 995
    theory of, 2208
Meters, a.c., rectifier-type, r.m.s., principles of, 339, 1217
  admittance, 0·1–10 Mc/s, 2556
  energy-flux, for cm waves, 998
  frequency-deviation, 2856
  hysteresis, for measurements on pulse-transformer laminations, 197
  for mains-voltage harmonics, 731
  moving-coil, 444
    standard, A.E.G., 735
  rectifier-type, scale-overlap and frequency errors in, 2279
  resistance and conductance, electronic, 2853
Microphones, absolute calibration of, 2690
  capacitor, input resistance of, 18
    for N.W.D.R. studios, 893
    sensitivity measurement by reactance-valve method, (C)894
    simplified reciprocity calibration of, 3312
Microscopes, (See also Electron microscope)
  proton, first results with, 2002
Microwaves, (See also Measurements; Wave propagation, e.m.)
  photographic field-display for, 3
  use in medical and biological research, 2292
Miniaturization, techniques for, 1549, 2754
Mixers, gain-stability improvement by application of negative feedback, 2018
  parallel-T networks for, 1537
  Type-6BN6 valves as, 794
Modulation, comparison of f.m. and a.m., 1103
  frequency, by means of capacitor with controlled charging time, 2067
    by means of reactance-valve circuits, characteristics of, 535, for large frequency deviations, 1462
    of transmitters by means of premagnetized h.f. iron-cored coil, 536
  grid, Taylor and Terman-Woodyard systems of, 1464
  meter, with logarithmic scale, 200, 2859
  product-phase, and demodulation, (C)264
  pulse-amplitude, conversion to pulse-duration modulation, 1526
  pulse-code, application to narrow-band transmission of teleprinter signals, 2893
    using circulated pulses, 3230
    delta, 2330, 2603
Modulators, cut-off, Cowan, with capacitor shunt, theory of, 2363
  frequency, oscillator circuits as, 283
    using quartz oscillator, 537
    using reactance-valve circuits, improved circuit for, 3266, operating conditions for, 2066
    serrasoid, 3589, operation of, 3267
  using frequency-dependent rectifiers, 282
  magnetic, for amplification of small d.c. signals, 1528
    theory of, 338, 607
  phase, microwave, travelling-wave valves as, 1463
  ring-type, third-harmonic distortion in, 1874
  for s.s.b. R/T transmitters, 2926
Monitoring, automatic, of B.B.C. programmes, 269
  by C.C.R.M. Brussels, of naval and air-service transmissions, 1038
Monitors, for a.m. broadcasting stations, 807
  automatic, for broadcast programmes, 806
    sequential and routeing, B.B.C., design of, 2034
  for f.m. transmissions, 2601
  frequency, for a.m. broadcasting transmitters, 1111
  for television waveforms, 2846
Motors, phonic, theory of operation of, 3564
Multivibrators, with capacitors between cathodes and earth, 2758
  chart for design of, 1556
  for decade frequency dividers, design of, 1557
  as test equipment, 1668

N

Navigation aids, (See also Radar)
  aerial, American plan for air-traffic control, 682
    Australian distance-measuring equipment, 1315, 2813
    Australian visual aural radio range, 1314
    automatic flight-path control, 1003
    C.A.A. v.h.f. omnirange, 1000, (C)2814
    for civil aviation, 2223, 3096
    Decca flight log, 1617, 1619, design of, 2224
    future developments in, 2037
    instrument landing systems, airborne receivers SR.14/15 and test gear for, 3098, test set for, 1685
    Marconi v.h.f. d.f. equipment, 1617
    Mullard 'telescribe' equipment, 1617
    multitrack range airborne equipment, 1618
    radar, for traffic control, at London airport, 1312, at R.A.E., Farnborough, 1313
    review of, 683
    search radar, use for Arctic flights, 1316
    straight-line-flight indicator for radar-equipped aircraft, 144
  d.f. systems, atmospheric sources of error in, 1308
  marine, cheap radio-beacon system for small ships, 3094
    requirements for, 1309, 1616
  rotating radio beacon with angle-dependent frequency, 1001
—— systems, aerial, long-range, Navaglobe, 1925
  consol, 147
  European Decca, 3436
    German network of stations, 1923
  hyperbolic, and common-wave broadcasting, similar problems of, 2515, 3437
    in Germany, 1311
    integration of German system with present Decca system, 3095
  shoran, aided layer for, 2518
Networks, (See also Circuit theory; Filters; Quadripoles)
  a.f. response of, charts for, 1539, 1540, 2745
  analysis of, Kron's matrix method for, 347
    by least-power theorems, 3370
  block-diagram transformation of, 1534
  branched, reduction of, and its application, 937
  delay, with continuously variable delay, 2142
    with maximally-flat characteristics, applications of, 3375
    rise time of, 2143
  design of, approximations in, 3371
  double-T, for R, L or C measurements at h.f., 724
  equivalent, for transcendental impedance functions, 2139
  feedback, minimum-phase, properties of, 1536
  general stability criterion for, 334
  generalized matrix theory of, (C)2151
  impedance of, tensor analysis of, 1859
  iterated, and application to differentiators, 2457
  ladder, for h.v. impulse measurements, 2267
    low-pass shunt-capacitance, effect of parameter variation on resonance frequency, 66
    RC, for specified transfer ratio, 348, synthesis of, 2144, transfer function of, 350
  lattice, symmetrical, 'non-canonical', theory of, 3378
  linear, characteristics of, square-wave determination of, 209
    frequency characteristics of, measurement of, 210
    general theory of transmission in, 1225, 3028
    initial excitation of, 934
    with time-variable lumped parameters, 1538
    varying-parameter, correlation functions and power spectra of, 1229
  matching, T, Π and L, design charts for, 322
  noise factor of, 2140
  nonlinear, with reactance, general theorems for, 1227
    with resistance, general theorems for, 1228
  operator, positive-feedback, 3372
  parallel-T, as mixers, 1537
  parameters of, determination of, 938
  passive, 2n-pole, synthesis of, 1547
  Π and T, transfer impedance of, 939
  quadripole, chain arrangements of, use of quaternions in theory of, 3374
    f.m., dynamic transfer coefficient of, 349
    linear, active, image impedance of, 2458, f.m. signals in, theory of, 3049, matrix transformation for, 68
    matrix analysis of, 936, conditions of validity of, 1228
    passive, analysis of, 1858, gyrator, 2459
    problems of, application of matrices to, 617
    theory of, 3030
    transients in, analysis of, 2146
  RC, coupling chart for phase shift and attenuation of, 3021
    as filters, 1542
    synthesis of, (D)2456
    2-terminal-pair, transfer function of, 3369
  reactance, a.f. response of, charts for, 1539, 1540, 2746
  realizability of, introduction to theory of, 2138, 2455
  separating, for operation of dm-wave transmitters or receivers on one aerial, 3036
    with series-resonance circuits, as blocking elements, 2463
  shunt-reactance, synthesis of, 3368
  synthesis of, by means of Tchebycheff polynomials, 2742
    by use of potential analogues, 3024
  T and double-T, applications of, 3032
  theorem for, 1535
  theory of, approximation method for functions with prescribed characteristics, 2461
    conditions for monotonic transient response, 618
    Hilbert transforms and Bayard-Bode relations, 1230
    one-sided Green's function in, 711
    practical realization of positive reactance functions, 3366
    for time-variable linear systems, 3022
  variable-delay, operational analysis of, 2460
  varying-parameter, n-mesh, oscillations in, 2470
  90°-phase-shift, cascade connection of, 1861
  6-pole and higher-order-multipole, equivalent circuits for, 355
  2-terminal, consisting of reactively connected valves, 3025
Noise, (See also Acoustics; Cosmic radiation, r.f.; Generators, noise; Solar radiation, r.f.)
  abatement, in offices of Administration française des P.T.T., 1816
  acoustic, repeated bursts of, sensitivity to intensity differences of, 1503, threshold and loudness of, 1502
    survey of measurement methods and apparatus, 2969
    white, measurement of loudness of, 1501
  background, effect on frequency of valve oscillators, 2486
    statistics of, 796
  characteristics of, 3161
  in crystal rectifiers, theory of, 3592
  flicker effect in carbon-film resistors, 341
  fluctuation, analysis of groups of peaks of, 1420
    analysis of voltage peaks of, 1419
    in electron beams without transverse magnetic field, 2397
    in transistors, 870, 2928
    valve-voltmeter measurement of, 189
  in photomultipliers, measurement of, 3593
  in photosensitive semiconductors, sources of, 1934
  in polymer-dielectric films, 3478
  random, low-frequency, generation and measurement of, 1030
    rate of occurrence of peaks in, 1766
  resistance fluctuations and flicker effect, mechanism of, 1253
  r.f., in d.c. gas discharge, 1891
    due to ionospheric thermal radiation, 406
    low-power, equipment for measurement of, 2560
    narrow-band, power spectrum after passage through nonlinear impedor, 1095
    random, theory of, 1096
    from solar flares and sunspots, 2212
  samples, criteria for evaluation of, 3542
  in semiconductors, due to passage of current, directional differences of, 2527
    theory of, 1325
  shot, in electron beams, space-charge smoothing of, 2396
    in Ge single crystals, 1936
  sonic and ultrasonic, in engineering and aviation, 2102
  source, u.h.f., gas discharge as, 185
  thermal and shot, in conductors and valves, 2174
  ultrasonic, from aircraft engines, and its physiological effects, 1496
    high-level, biological effect of, 2416
  valve, direct-reading instrument for, 1967
  valve-grid, induced, and noise factor, 559

O

Optical levers, with photoelectric amplifiers, design of, 201
Oscillations, in circuit with periodically varying capacitance, 76
  forced, due to periodic e.m.f. of arbitrary waveform, 77
    subharmonic, 1571, in circuits including iron-core reactors, 2155
  locked, in circuits with nonlinear resistors, 75
  in n-mesh networks with varying parameters, 2470
  nonlinear, periodic solutions for, numerical calculation of, 3154
  plasma, in double-electron-beam system, 104
  sawtooth, analysis of, 630
  in systems with delayed action, 3040
Oscillators, (See also Generators)
  a.f., electron-coupled, giving several harmonic frequencies, 3044
    frequency-sweep, wide-range, 380
    for room-acoustics measurements, 1382
  beat-frequency, a.f., theory of mixing in, 2475
    and their constancy, 80
    distortion in, 1552
  blocking, control of amplitude of, 1551
    in television-receiver deflection systems, 2061
  build-up process in, 2161
  decade, precision, 1 c/s–100-kc/s, 3512
  frequency-sweep, 20–1000-Mc/s, 1056
  with high frequency-stability, circuits for, 2734
  LC, synchronization of, 1868
  locked, action and applications of, 2474
    frequency spectrum of, 3043
  magnetostriction, hysteresis losses in, 303
  magnetron, modulated, frequency control by resonant injection system, 2733
  master, for f.m. u.s.w. broadcasting transmitter, 2647
  nonlinear, extension of Nyquist's theory to, 335
  phase-shift, incorporating amplidyne generator, 1553
    L-C-R, 3382
    variable frequency, 359
  piezoelectric, characteristics of various types of, 3304
  quartz crystal, a.f., characteristics of, (A)2472, 3378
  R-C, a.f., 1370
    balanced, 0·1–20-c/s, 82
    sine-wave, (D)3381
  RC and RL, theory of, 1867

  - RC-bridge-type. wide-range, **81**, **(C)1889**
  - retarding-field type, **2390**
    - for 8–15 kMc/s, **2948**
  - u.h.f., triode, with series-tuned circuit, **3046**
  - ultrasonic, magnetostriction, laminated, theory and design of, **392**
  - valve, effect of background noise, on amplitude of, **2162**, on frequency of, **2163**, **2486**

P

- **Particle accelerators**, beam-current indicator and integrator for, **1039**
  - betatron, air-cored, coil system for, **2566**
    - and applications, **1995**
    - 31-MeV, medical applications and shielding of, **1996**, at Zürich radiological institute, **1993**, **1994**
  - bevatron, power plant for, **3198**
  - cyclotron, at Birmingham University, **2568**
    - f.m., dee-bias system for, **762**
    - with poles 225 cm diameter, at Stockholm, **2567**
  - e.s., practical applications of, **1069**
  - linear, axial motion of electrons in, **3518**
    - dynamics of, **3201**
    - for electrons, cavity field-strength measurement for, **2264**, M.I.T., **2295**, particle dynamics for, **2296**, as pulsed neutron source, **1388**, waveguide-type, **2294**, at Yale, **220**, 1-MeV, **1068**, 6-MeV, **221**
    - for ions, e.m. field in, **3199**, numerical calculation of, **3200**
    - for protons, helix as, **1694**
  - synchrocyclotron, at Amsterdam, electromagnet for, **223**
    - r.f. units for, **1070**
  - synchrotron, betatron-started, r.f. requirements of, **222**
    - with straight sections, forced betatron oscillation in, **761**
- **Pendulum**, a.c.-maintained, theory of, **1257**
- **Permeameters**, developments and simplifications in, **3499**
- **Phase** changer, waveguide, adjustable, errors in, **2711**
  - inverter, split-load, analysis of, **1848**
  - measurement, h.f., with direct indication, curve tracers for, **1980**
  - meters, **2273**
    - direct-reading, using c.r. tube, **2857**, **(D)2858**
    - l.f., precision calibrator for, **1981**
    - simple, for 100 c/s–25 kc/s, **3510**
- **Phosphorescence**, theory of, **1880**
- **Phosphors**, $CaSO_4$-Mn, properties under ultraviolet excitation, **153**
  - $CaSiO_3$, optical properties of, **3109**
  - $CaWO_4$ and ZnO, decay of luminescence of, **3442**
  - CdI_2-$Pb(NO_3)_2$, **1320**
  - CdS, photoconductivity and luminescence of, **151**
  - for c.r. tubes, recent developments in, **686**
    - R.T.M.A., standard, review of characteristics of, **1931**
  - crystal, physics of, **3054**
  - developments in, review of, **1623**
  - with Fe, Ni or Co poison centres, electron levels in, **2232**
  - K and Na halides, activation susceptibility of, **1318**
  - radiationless transitions of electrons in, **1260**
  - transfer and transport of energy by resonance processes in, **1882**
  - ZnS, electron penetration and scattering in, **152**
    - electron traps in, **3440**
    - photoconductivity and luminescence of, **150**
    - and theory of oxidic semiconductors, **1625**
  - ZnS-Ag and 9ZnS.CdS-Cu, size effects in luminescence of, **1319**
  - ZnS-Cu, inhibiting action of Fe on luminescence of, **421**
  - ZnS-Cu single crystals, electroluminescence of, **3439**
  - (Zn : Cd)S, induced conductivity and light emission of, **3438**
- **Photocells**, applications of, control of ion source of e.s. particle-accelerator, **1066**
    - device for scanning curves, **1992**
  - barrier-layer, relations for, and derived theory, **1147**
    - Se, response of, theory of, **3273**
  - CdS, properties of, **1770**
  - CdSe, properties of, **1148**, **1149**
  - composite cathodes for, photoconductivity of, **859**
  - Cs-Sb, properties at temperatures down to − 196°C, **2070**
  - electron-multiplier, E.M.I., nonlinear amplification in, **3272**
    - measurement of fluctuations in, **3593**
    - 'mosaic'-type, as magnetic-field indicators, **894**
    - polarization effects in, **3270**
    - pulsed operation of, **3209**
    - R.C.A. 5819, production testing of, **3271**
    - for ultraviolet range down to 1450 Å, **2369**
    - for ultraviolet range down to 1500 Å, using Cu-Be alloy, **3594**
    - use of image converter for extending wavelength range of, **1067**
  - Ge, electrical characteristics of, **1468**
    - large-area, **2656**
  - ion-bombarded Si, properties of, **2929**
  - PbS, impedance measurements on, **3595**
    - properties and applications of, **3596**
    - single-crystal, single-contact, **2654**
  - PbS and CdS, for amplification of light-intensity fluctuations, **3196**
  - PbSe, long-wave limit of, **1771**
  - PbTe, single-crystal, single-contact, **2655**
  - Se, improvements in, **540**
    - and Se rectifiers, effect of Hg vapour on, **3474**
  - tabulated data of available types, **2395**
- **Photoconductivity**, in amorphous Se, **1006**
  - of BaO, **149**
  - of BaO single crystals, **148**
  - of CdS, quenching of, **3105**
  - of CdS crystals, under irradiation by medium-energy electron beams, [illegible]
  - of CdS and CdSe crystals, **1007**
  - of evaporated Se films, **3104**
  - infrared, of PbTe films, **860**, mechanism of, **861**
  - of ionic crystals, and F-centres, **420**
  - of PbS single crystals, and infrared transmission of, **703**
  - processes in, analysis of, **1005**
  - of Sb_2S_3, **1008**
  - of semiconducting Sb films, **2522**
- **Photoelectric effect**, in Cs-Ga, Cs-In and Cs-Tl photocathodes, **2069**
  - in natural PbS, **1930**
  - and Sb content of different samples of galena, **3106**
- —— **emission**, of BaO, **149**
- —— **materials**, PbS and PbTe, optical constants of, **1938**
  - PbTe, PbSe and PbS oxygen-free single crystals, production of, **2830**
- **Photography**, electro-optical shutters for ballistics research, **3529**
  - image converters as high-speed shutters in, **1400**, **1693**
  - of oscillograms and television images, **1647**
- **Physical quantities**, relative magnitudes of, **2259**
- **Piezoelectric constants**, simple method for measurement of, **2844**
- —— **crystals**, (See also Quartz)
  - EDT, growth-rate of, **2543**
  - elastic constants of, **3141**
  - factors influencing growth of, **1346**
  - KH_2PO_4, free and clamped, permittivities of, **1339**
  - mechanical strength of, **3142**
  - $NH_4H_2PO_4$, theory of properties of, **3398**
  - for pressure, temperature and humidity measurements, **(A)1058**
  - Rochelle salt, theory and measurement of characteristics of, **422**
  - square plates vibrating in contour modes, properties of, **704**
  - synthetic, for electroacoustics and h.f., **1933**
- **Plasma**, electron, h.f. oscillations in, **3411**, theory of, **3063**
  - gas-discharge, in h.f. e.m. field, **1890**
  - ion, energy losses of charged particles in, **1267**
  - oscillations, e.s., application to conditions in metals, **1964**
    - review of, **652**
    - and striations, **2777**, **2778**
  - solar, condition for radiation from, **2205**
  - with translational symmetry, theory of, **381**
  - wave theory of, **3410**
- **Potential**, constant, between electrodes in gas ionized at h.f., **2189**
  - contact. (See Contact potential)
  - surface, use of radioactive deposits in study of, **2773**
- **Power** measurement, for h.f.-heating generators, **1035**
    - microwave, absolute, radiation-pressure method for, **1052**, **2849**, **2850**, calorimeter method for, **3185**, using self-balancing bridge, **204**
    - r.f., bolometric, accuracy of, **3511**
    - on ultrasonic quartz oscillators, **734**
  - meter, and mismatch indicator, for 150–250 Mc/s, **449**, **(D)1680**
  - supplies, a.c., constant-voltage, **3505**
    - carrier-type, 0–300 V, 0–50 mA, **1740**
    - h.v., high-stability, **1743**
    - stabilized, for ion source, **3515**, 1600-A, for computer valve filaments, **1741**, for 4000-valve computer, **1436**, 2·5–6 V, [illegible]
    - with variable h.v., **3562**
- **Pulses**, amplitude standardizer for, **1524**
  - delay unit, for radar ranging, **331**
  - detection near noise threshold, **1307**
  - discrimination by means of delay lines, **2129**
  - frequency-spectrum analysis for nonrecurrent groups of, **1721**
  - mixing unit for, **1523**
  - mμs, techniques and measurement circuits for, **2730**
  - periodic, h.f., measurement of peak power of, **733**
    - h.f. and l.f., measurement of peak voltage of, **1955**
  - reproduction of, **3007**
  - sharpening circuit for, **2476**
  - technique of, definitions of terms for, 52 IRE 20 S1 standard on, part 2, [illegible]
    - vocabulary of French terms used in, **2672**
  - transmission-line inverter for, **3361**

Q

- ***Q* factor**, measurement of, for microwave cavity resonator, by means of calibrated h.f. circuit, **1960**, methods for, **3496**
  - meter, based on damped free oscillations, **1676**
- **Quadripoles**, (See also Networks)
  - electromechanical, linear, theory of, **621**
  - graphical study of, at constant frequency, **935**
  - gyrator, microwave, using Faraday effect in ferrites, **1233**
  - nonreversible, equivalent circuits of, **3031**
- **Quantum theory**, of fields, mathematical aspects of, **644**
- **Quartz** crystals, determination of parameters of, **2549**, **3160**, at 10–180 Mc/s, **1379**
    - forced vibrations of, **2156**
    - growth of twinning under stress, **705**
    - h.f., deposition of electrodes on, vacuum technique for, **1943**, for primary frequency standards, **3481**
    - HT-cut, with zero temperature coefficient, **1641**
    - manufacture of, **175**
    - resonance curve of, circle-diagram method for plotting, **2550**
    - resonators, effect of heat treatment on, **3144**, frequency variation with high pressure, **1350**, measurement of electrical constants of, **722**, for range 1 kc/s–40 Mc/s, British Post Office types, **1239**, thickness-shear-mode, using circular bevelled plates, **2544**, ultrasonic, power measurements on, **734**
    - safe current for, **2757**
    - temperature variation of h.f. dielectric constant at 20° to 700°C, **2831**
    - thermal twinning and mechanical detwinning of, **2831**
    - X-cut, free from harmonics, **430**

R

- **Radar**, (See also Navigation aids)
  - anticollision, for high-speed commercial aircraft, **2815**
  - British development of, **1609**
  - c.w., circular polarization for, **2811**
  - display, narrow-band relay transmission system for, **1921**, **3430**
  - distance measurement by, **1611**, **2810**
  - echo and noise in system subjected to deliberate interference, **3090**
  - echoes, from precipitation, 'bright band' in, **680**
    - from rain, **681**, **1612**
    - from snow, observations at 3-cm λ, **1613**
    - from sun and planets, possibility of, **2513**
  - echoing areas of targets, measurement technique for, **2512**
  - equipment, instructional, **2220**
    - for R.A.F., engineering of, **3091**
  - G.C.A. blind-landing system, **145**, **146**
  - in Germany, prewar and war-time developments of, **1306**
  - ground clutter, fluctuations of, **(A)2514**, **3435**
  - ground equipment, **994**
  - lightning detection by, **1614**
  - marine, commercial, British, **1924**
    - for merchant ships, modern developments in, **3089**
  - port equipment, Decca, **1310**
    - at IJmuiden, **3432**, indicator equipment for, **3433**, transmitter and receiver for, **3434**
    - at Le Havre, **2222**
    - survey of requirements for, **3431**
  - range, application of noise statistics to prediction of, **(D)2221**
  - receivers, use of information theory in design of, **993**
  - rotating-horn 'organ-pipe' scanner for, **1920**
  - transponders, miniature, for aircraft, **418**, for guided missiles, **2225**
    - and their special circuits, **1922**
- **Radiation**, (See also Aerials)
  - e.m., problems of, application of compensation theorem to, **591**
    - produced by electron collisions in strongly ionized medium, **2780**
  - field, of two radiators, representation by constant-phase and constant-amplitude curves, **1201**
  - from multipoles, theory of, **965**
- **Radio** communication, transatlantic, 50th anniversary of, **2023**
  - pictorial, history of development of, **2219**
  - progress, I.R.E. review for 1951, **2404**
- —— **links**, (See also Communication systems; Radiotelephony; Relay systems; Television)
  - design fundamentals for, **3234**
  - design of radiotelegraph receiving system for, **2017**
  - dm-λ, with 'master and slave' frequency control, **1732**
  - dm-λ and cm-λ, and C.C.I.F. requirements, **2896**
    - planning of, **1431**
  - f.m., u.s.w., multichannel, nonlinear crosstalk in, **1429**
    - 50-Mc/s, **2614**
    - 70–88-Mc/s, multichannel, in Colombia, **1430**
  - general technical considerations for, **2028**
  - m-λ, beyond optical range, calculations for, **1410**
  - microwave, for Bonneville power system, **3236**
    - f.m., use of klystrons in, **2895**
  - multichannel, from Athens to Rome and Crete, **2607**
  - multiplex, evaluation of signal/noise ratio for, **2608**
  - p.a.m., short-distance, **2029**
  - planning of, **260**
    - for German telephone and television network, **2033**
  - for power stations, **2031**
  - for telecommunications, **2610**
  - for telephony, **2611**
    - Dijon-Strasbourg, **2612**, equipment for, **2613**
    - in Jutland, **1106**
    - Turin-Piacenza, **803**
  - use of travelling-wave valves in, **2894**
  - u.s.w., transportable equipment for, **2032**
  - for widely separated coincidence counters, **1734**
- **Radiotelegraphy**, multiplex pulse systems for, **3232**
  - teletype, application of transmitter diversity in, **799**
- **Radiotelephony**, (See also Communication systems; Radio links; Relay systems)
  - equipment, portable, for ship-to-port communication, **3553**, transmitter-receiver, Type SUF-21K, 30–50-Mc/s, **2398**
    - v.h.f., mobile, a.m. and f.m., **262**, mobile, conditions for development in France, **263**, single-channel, subscriber-type, **492**
  - multichannel, on v.h.f. radio links, **3233**
  - multiplex, f.m., echo distortion in, **2022**
  - signals, spectrographic investigation of, **742**
    - for trains, in U.S.A., **261**
- **Reactors**, saturable, as r.f. remote-tuning elements, **3394**
    - series-connected, with high-impedance control source, **3015**
    - transient eddy-current phenomena in, **1220**
- **Receivers**, (See also Television; Radar)
  - a.m., superheterodyne, pulse response of, **1418**
  - battery-operated, French Standard C92-120 on, **3221**
  - broadcasting, four, proposed tests for, **1984**, v.h.f., without limiter and discriminator, **1733**
    - using Ge triodes, **1115**
    - ionodyne, for use with ionophone loudspeaker, **1094**
    - pretuned, 4-station, **1091**
    - tuned r.f., **1092**
    - 12-years' progress in design of, **2877**
  - combined, for radio and television, **1090**
  - communication, flexible selectivity for, **2015**
    - s.s.b., Marconi, Types HR92 and HR93, **2878**
  - d.f., matched-channel, component selection for, **999**
  - directional methods for enhancing resolution in, **790**
  - for dm and cm waves, with diode mixers, sensitivity of, **1719**
  - double-superheterodyne, for use in transmitter-frequency measurements, **2858**
  - f.m., analysis of two-circuit band-pass filter in Riegger discriminator, **2321**
    - communication, selectivity tests for, **745**, **(C)1985**
    - for 90-Mc/s band, **1093**, modification of, **2589**
  - performance of, systematic analysis of, **252**
  - pulse, comparison of amplifier circuits for, **(C)364**
  - superheterodyne, alignment of, approximate formulae for, **3540**
    - diagrams for ganging calculations for, **53**
    - i.f. stage design for, **2019**
    - impulse response of, operational analysis of, **(A)2879**
    - for pulse reception, **481**
    - tracking problem in, **2323**
    - tracking of, **482**, **1417**
  - s.w., commercial, **251**
  - 26-Mc/s, for station reception of programmes from remote transmitter, **480**
  - 460-Mc/s, design of, **793**
- **Reception**, (See also Field strength; Television; Wave propagation, e.m.)
  - broadcasting, volume control for fidelity in, **486**
  - in France, of world broadcasts, **3228**
  - of overseas broadcasts on medium waves, **256**
  - of periodic signals in noise, application of correlation analysis to, **(D)479**
  - of signals in noise, **1718**
    - electronic correlator for, **248**
    - theory of, **2322**
  - of transatlantic signals of frequencies near 30 Mc/s, **1086**
  - and transmission, common-aerial, of circularly polarized microwaves, **281**, of v.h.f. waves, **538**
- **Recorders**, (See also Sound recorders)
  - for atmospheric potential gradient and air-earth current, **1028**
  - circle-diagram, for a.f. range, **740**
  - c.r.o. equipment for h.f. response curves, **3509**
  - digital, electronic, SETAR, for serial events, **2310**
  - ionosphere, automatic, C.R.P.L., **1918**
    - panoramic, 16-kW, 1–20-Mc/s, **719**
    - 5–10-Mc/s, design of, **3064**
  - for scaling units, **3524**
  - waveform, automatic, for atmospherics, **679**
    - magnetic-tape, boundary-displacement, **1963**
- **Recording**, (See also Sound recording)
  - magnetic system, 'ferrography', **1705**
  - magnetic-tape, of e.s. field changes, **190**
- **Rectification**, of a.c. with high modulation, **1744**
  - contact, with molybdenite and tungstenite, **3147**
    - between semiconductors of same type, theory of, **494**
    - with Te, **3131**
  - diffusion theory of, **3402**
  - effects with natural and sulphurized galena, **3473**
  - at surfaces of Ge and PbS crystals, **1635**
  - volume, in zincite crystals, **158**
- **Rectifiers**, (See also Transistors; Valves, crystal)
  - barrier-layer, **1939**
    - general theory of, **3472**
    - temperature effect on barrier height and breakdown voltage of, **706**
  - cold-cathode, h.v., Hg-vapour, with magnetic field, **2927**
  - crystal, temperature-dependence of characteristics of, **1645**
  - Cu_2O, deviation from Ohm's law at anode surface of, **2043**
    - resistance stratification in, **271**, **272**
    - theory of, **1121**
  - dry, voltage drop and backward current in, **187**
  - electrolytic and barrier-layer, unforming of, **2042**
  - Ge, G-10 dot type, for radio power supplies, **3241**
  - half-wave, with capacitive smoothing, analysis for, **1745**
  - quadripole equivalent of, 'transrector', **1120**
  - Se, breakdown in, **3568**
    - characteristics of, **2340**
    - creep phenomena in, **2044**, **2832**
    - recovery after backward voltage pulse, **813**
    - reversible changes in boundary layer of, **1642**
    - and Se photocells, effect of Hg vapour on, **3474**
    - Siemens, characteristics of, **3363**, and design of transformers and chokes for, **503**
    - static and dynamic characteristics of, **3242**
    - use in computing and control circuits, **3017**
  - Se and Cu_2O, d.c. resistance at 79°–300°K, **2621**
  - Se-disk, effect of bending of, **2622**
  - Si and Ge, theory of noise in, **3592**
  - surface-layer, h.f. properties of, **3566**
  - thyratron, use in broadcasting transmitters, **3569**
  - TiO_2, development at N.B.S., **3567**
- **Reflection**, (See also Sound; Wave propagation, e.m.; Waves)
  - acoustic, of pulse, by paraboloid, **2683**, by spherical surface, **2682**
  - coefficient, of ice and snow at 3·2-cm λ, **3494**
  - of e.m. waves, from slightly rough surfaces, **664**
    - by wire gratings, **3057**
  - ionospheric, of long waves, wave solution for, **137**
  - of 1·42-Mc/s waves, **3427**
  - of narrow ultrasonic beam, inadequacy of plane-wave theory for, [illegible]
  - total, of spherical waves, theory of ray displacement in, **2770**
    - of ultrasonic beam, lateral displacement in, **3414**
- **Reflectometer**, coaxial-line, for aerial-matching measurements, **3435**
- **Refraction**, of evanescent e.m. cm waves in waveguide, **34**
- **Refractive index**, of air and main constituents, at 24 kMc/s, **1371**
- **Refractometer**, microwave, recording, airborne, **3493**
- **Regulators**, voltage, using magnetic amplifier, **1123**
- **Relay systems**, (See also Communication systems; Radio links; Radiotelephony; Television)
  - dm-wave, IDA-22 equipment for, **1432**
  - microwave, applications for power systems, **3235**
    - Copenhagen-Skamlebaek, **1105**
    - p.m. 24-channel equipment for, **1107**
    - TD-2, **1109**, unattended repeater equipment for, **1110**
  - r.f., in Cuba, **1108**
  - u.h.f., multiplex, design calculations for, **496**
  - wide-band, review of, **265**
    - 80–300 Mc/s, design data for, **495**, **(C)2030**
- **Research**, at Army Signals Research and Development Establishment, **3622**
  - at Bernard Price Institute of Geophysical Research, 1938–1951, **992**
  - at microwave physics centre, Florence, during 1950, **881**, during 1951, **3395**
  - organization of the Royal Naval Scientific Service, **2959**
  - radio, at Cambridge University, **880**
    - Radio Research Board report for 1950, **2399**
  - scientific, by Philips' Industries, 1891–1951, **560**
  - in s.w. absorption-spectroscopy, at Oxford University, **2957**
  - telecommunications, etc., at British Post Office Research Station, **1486**
- **Resistance** coils, standard, flat spiral type, design of, **2452**
  - h.f., of metals in normal and superconducting state, **3080**
  - impulse, of earth electrodes and embedding materials, **428**
  - very high, measurement of, **726**
- **Resistivity**, of binary metallic mixtures, **3447**
- **Resistors**, carbon-film, flicker effect in, **341**
  - metal-film, **2736**

- metallized-filament type, r.f. characteristics of, 1530
- nonlinear, electronic control of, 1851
  - polaristors, colloidal suspensions and mixtures used in manufacture of, 3150, production and properties of, 2538
  - with sintered-carborundum base, 1219, 3364
- r.f., for power up to 100 kW, 2451
- SiC, industrial applications of, 2737
  - in series with impedance, (D)1529

- **Resonance,** in series and parallel circuits, 3367
- **Resonators,** acoustic, damping of, 2687
  - cavity, coupled, resonance frequencies in, 1550
    - cylindrical, with stratified dielectric, natural oscillations of, 1242
    - detection of small variations of *Q* of, 192
    - double-paraboloid, loop-excited, 2159
    - effect of circular apertures in walls of, 632
    - effect on E_{010} and E_{011} wave modes of deformation of, 1243
    - field-strength measurements in, 2265
    - rectangular, degenerate modes in, separation of, 79
    - resonance-resistance measurements at cm wavelengths, 1959
    - spheroidal, resonance frequency of, 357, with small confocal spheroid, 2160
    - surface losses in, 3042
    - with tilted end-plate, mode-conversion losses in, 1866
  - coaxial, capacitance-loaded, theory of, 358
  - Helmholtz, multiple, theory of, 3311
    - as sound absorbers in broadcasting studios, 2424
  - magnetostrictive, ferrite, 624

S

- **Sea water,** electrical properties of, 3424
- **Seals,** glass, butt and graded, theory of stresses in, (D)2249
  - sapphire/glass, 178
    - for PbTe photocells, 179
- **Semiconductors,** activation energy and impurity concentration in, 423
  - α-Fe_2O_3, 1329
  - α-Fe_2O_3 and α-Fe_2O_3-Ti, electrical properties of, 1009
  - α-Fe_2O_3 single crystals, properties of, 3125
  - apparatus for electrical measurements on, 3175
  - CdO and NiO, conduction properties of, 700
  - CdS layer in vacuum, contact potential of, effect of light on, 1627
  - Cu_2S, conductivity and Hall effect in, 2241
    - physical properties of, 2242
  - current in, partial differential equations for, 1626
  - Fe oxides, properties of, 3138
  - ferrites, Ni/Zn, dispersion of resistivity and dielectric constant of, 162
    - temperature variation of resistivity of, 1322
  - flow of holes and electrons in, partial differential equations for, 1010
  - Ge, diffusion in, of donor and acceptor elements, 2822, measurement by capacitance method, 2821, measurement by *p-n*-junction method, 3134
    - electron and hole production by α particles, 1636
    - electron-hole recombination in, 3453
    - electron mobility in, 1011
    - liquid, resistivity of, 1338
    - magnetoresistance of oriented single crystals of, 166
    - mechanisms governing properties of, 3452
    - neutron bombardment of, effect of, 163, production of hole traps by, 1637
    - *n-p-n* junction, as model for secondary photoconductivity, 1638
    - *p-n* junctions, effect of pressure and temperature on resistance of, 1324, probing of space-charge layer of, 2526
    - production from flue dust, 3136
    - rectification phenomena and transistor action in, 2234
    - single-crystal, properties of, 3135, shot noise in, 1936, Zener current across *p-n* junctions in, 164
    - thermal production of acceptors in, 2235
  - grey tin, electrical properties of thin layers of tin containing, 2829
    - magnetism of free charge-carriers in, 1321
  - influence of surface energy levels on properties of, 3401
  - internal barriers in, 377
  - mobilities in, effect of dislocations on, 3448
  - molybdenite, properties of, 3454
  - noise in, theory of, 1325
  - oxide, impurity scattering in, 2524
    - theory of, and ZnS phosphors, 1625
  - oxide mixtures, conductivity of, 2525
  - PbS, 425
    - conductivity/temperature characteristics in oxygen atmosphere, 702
    - rectifying properties of, 1343
  - PbS, PbSe and PbTe single crystals, absorption spectra of, 3107, conductivity of, 3140
  - PbSe, crystal diode and triode action in, 1161
  - photosensitive, sources of noise in, 1934
  - properties of, 2820
    - at high temperatures, 165
    - and theory of, 159
  - *p*-type, conductivity of, 160
  - radiationless transitions of electrons in, 1260
  - resistivity and Hall constant of, (C)170
  - review of present-day theory of, 3061
  - Se, amorphous, dielectric constant and loss at 3-cm λ, 3466
    - effect of Hg on, 2539
    - microcrystals of, conductivity and Hall effect of, 696, electrical properties of, 1335
    - optical properties of, 1013
    - physical properties of, 1336
    - single-crystal, conductivity, Hall effect and thermoelectric power of, 697, electrical properties of, 698
    - structure of, 2540
  - semiconducting Sb films, photoconductive properties of, 2522
  - Si, ion-bombarded, photoelectric properties of, 2929, rectifying properties of, 1337
    - mobility of electrons in, 2233
    - *p-n* junctions, a.c. characteristics of, 1323
    - sign of thermal e.m.f. of, 3132
    - single-crystal, elastic constants of, 1014
    - theory of impurity centres in, 972
  - Si and Ge, far-infrared transmission of, 2231
    - lattice parameters, expansion coefficients and atomic weights of, 2541
  - Si films, conductivity of, 3451
  - Te, Hall effect in, interpretation of double reversal of, 3130, and resistivity of, 3129
    - optical properties in infrared of, 2230
    - single-crystal, properties of, 3450
  - theory of conductivity of, 2193
  - and thermistors, conductivity of, 1845
  - TiO_2, conductivity and thermoelectric properties of, 1344
    - dielectric properties of, 1345
  - transistor materials, thermoelectric effects at surfaces of, 161
  - tunnel effect at potential barrier in, 2194
  - ZnO, electrical properties of, 699
- **Servomechanisms,** (See also Control systems)
  - a.c., compensation networks for, 501
  - analysis of, generalized method for, 2040
  - analysis of stability of, 1435
  - d.c., stabilization of, 1738
  - electronic simulators for, 1689
  - general criterion for stability of, 502, 2041
  - for heterodyne-oscillator drive, (A)720
  - linear, with variable parameters, stability of, 2339
  - multidimensional systems, theory of, 2338
  - position-fixing, analysis of, 1739
    - with simultaneous coarse and fine setting, 2900
  - review of, 1118
  - sampling, mathematical theory of, 811
  - stability and accuracy of, 2038
  - use of amplifying dynamos in, 2620, 3240
  - use of nonlinear elements for improving performance of, 1117
- **Signal generators,** (See also Test equipment)
  - a.f., survey of, 188
  - microwave, with crystal control, 1055
- **Signal/noise ratio,** for multiplex radio link, calculation of, 2608
- **Signals,** of given duration and minimum spectral width, 1722
  - increasing, plus noise, probability of axis crossing for, 715
  - transmission in nervous system, 453
  - weak, in noise, theory of measurement of, 2885
- **Simulation,** use in system design, 1059
- **Soil,** electrical constants at u.h.f., 2498
  - permittivity at u.h.f., effect of moisture on, 2793
- **Solar activity,** world-wide observations of, 114
  - May–Nov. 1948, and ionospheric effects, 1715
- —— **corona,** electron density in, radio determination of, 1281
- —— **eclipse,** 1st Sept. 1951, ionospheric effects of, 2800
  - 25th Feb. 1952, observations in the Sudan, 2784, 2785, 3077
    - projected observations at Khartoum, 2787
- —— **flares,** geomagnetic effects of, 2500
  - ionospheric effects of, 134
  - and sunspots, r.f. noise from, 2212
  - 1936–1949, geomagnetic and ionospheric effects of, 389
- —— **observations,** review of, 2209
- —— **prominences,** correlation with sunspot cycle, 3422
- —— **radiation,** r.f., absence of 1420-Mc/s H line from, 977
    - bursts of, origin of, 3075
    - during eclipse, 1st Sept. 1951, 1282, 25th Feb. 1952, 2785, 2787
    - and electron oscillations excited by shock wave, 1900
    - from localized high-temperature regions, 116
    - mm-λ, observation of, 3076
    - plasma-oscillation theory of, 104, 2205
    - review of, 117, 1279
    - 97-Mc/s, observations of sources of, 1901, 1902, 2781
    - 169-Mc/s, during recent eclipses, and ellipsoidal form of sun, 2786
  - ultraviolet and X-ray, measurements in rockets of, 115, 976
- **Soldering,** and welding, of Al with Chemalloy, 2248
- **Sound,** (See also Absorption; Acoustics; Diffraction; Reflection; Wave propagation; Waves)
  - analysis, by optical method, theory of, 1499
  - attenuation in water containing air bubbles, 1812
  - edge tones, mechanism of, 3303
  - field, near circular transducer, 2678
    - of disk in finite circular baffle, 1180
    - of finite source on rigid cylinder, 1800
    - photographic display of, 3
    - radiated by and diffracted by disk, proportionality of, 1493
    - second-order, energy relations in, 2964, pressure-density relation in, 2963
  - insulation, of Royal Festival Hall, London, 13
  - propagation, along boundary, measurements on, 296
    - along constant-normal-impedance boundary, 297
    - through gases in narrow tubes, 2408
    - in horns, theory of, 1798
    - in ocean, effect of temperature nonuniformity on, 294
    - theory of, analogy with theory of quadripoles, 1491
  - public-address systems, centralized vertical loudspeaker arrays for, 2425
  - radiation, from circular emitter, 295
    - of pulses by plane piston diaphragms, 2
    - in public-address systems, 308
  - reception, directional, application of correlation analysis to, 790
  - reflection of pulse by parabolic cylinder or paraboloid, 3307
  - reinforcement systems, assessment of, 572
  - reinforcement and reproduction system for Royal Festival Hall, 1821
  - resonance effects with short trains of pulses, 1185
  - scattering, at fork in circular guide, 1495
    - by thin elastic shells, 3299
  - single-channel transmission and reception, theory of, 2419
  - sources, cylindrical and spherical, radiation loading of, 2680
    - directive arrays, design of, 1799
    - directivity index for, (D)3302
    - electronic, use in broadcasting, 3324
    - jet-edge, characteristics of, 2681
    - piston, in finite circular baffle, radiation loading of, 2413, velocity potential of, (C)2412, velocity potential of, expansion for, 2677
    - ribbon-type, theory of, 3301
  - transmission, in buildings, measurement of, 11
    - in open air, and wind noise, 1
    - through plates, 2411
    - transient phenomena in, 2407
  - velocity, in gases at low pressure, 2691
    - in porous media, 2962
- —— **recorders,** magnetic, R.C.A. 10794 head for, 25
  - 3-pole head for, 2110
- —— **recording,** comparison of various methods of, 3330
  - magnetic, bibliography of, 24
    - coated rubber bands for repeated-message applications, 2428
    - editing equipment for, 900, 1823
    - high-fidelity, trends in, 3332
    - magnetic processes in tapes and heads, 901
    - measurement of tape speed in, 1192
    - mechanism of, 2109, 2427
    - 'recording demagnetization' effect in, 23
    - review of, 1511
    - sound-film applications of, 2981
    - tapes for, anisotropy of magnetization of, 3333, classification of, 2982, crystalline structure and electroacoustic properties of, 3334
  - new system using c.r. tube, 2702
  - and reproduction, disk, microgroove, survey of basic problems of 2976, modern trends in, 3331
    - equipment for, 2700
    - magnetic, frequency response in, 313, print-through and its reduction, 2980
- —— **reproducers,** disk, long-playing, Philips, 1507
    - pickup arms for, damping of, 1813
    - R.C.A. light-weight pickup and arm for, 888
  - for engraved-tape records, 2426
  - measurement of pitch fluctuations in, 2698
- —— **reproduction,** automatic volume control in, 940
  - disk, B.B.C. desk for, 899
    - needle-drag distortion in, 2423
    - thorn needles for, (D)2422
  - electronic volume compression in, 2152
  - high-fidelity, 2105
  - magnetic, effect of reproducing-head spacing on, 889
  - stereophonic, fundamentals of, 2970
    - space-information transmission in, 1815
- **Space charge,** (See also Valves)
  - clouds, expansion of, 2370
  - equation for, considerations on, 3591
  - in equilibrium with secondary-emission insulator and constant-potential enclosure, 2364
  - field with two-way flow, potential in, 1775
- **Spectrograph,** sound-film, for acoustic analysis, 564
- **Spectrometer,** mass, defects due to space charge and magnetic-field saturation, 2290
  - radio, see Analysers, frequency-spectrum.
- **Spectroscopy,** microwave, 1051
    - at 2–3 mm λ, 1896
- **Speech,** loudness scale for, 2693
  - reinforcement system in St Paul's cathedral, 1506
  - sounds, analysis and automatic recognition of, 2971
  - waves, probability distributions of, 3314
- **Stability** criterion, general, for networks, 334, for servomechanisms, 502, 2041
    - Nyquist diagram calculation by use of Bode's relation, 56
  - of feedback amplifiers, 367
  - of servomechanisms, analysis of, 1435
  - theory of, 332, 333
- **Stabilization,** (See also Frequency stabilization)
  - of anode voltage of a.f. amplifier, 3570
  - of direct voltages, 273
  - frequency, automatic, of klystron in measurements of gas dielectrics, 3167
    - of microwave oscillator by NH_3 absorption line, 3487
    - by microwave spectral lines, and 'atomic' clocks, 1659
  - of television vertical-deflection amplifiers, 1761
  - voltage, review of methods of, 1748
- **Stabilizers,** alternating-voltage, 2046
    - using electric lamps as reference sources, 3243
    - for lamps and valve heaters, 1742
  - current, general theory of, 2623
    - for 40-kW electromagnet, 760
  - voltage, characteristics of glow lamps in, 506
    - general theory of, 814
    - with self-regulated heater supply, 1747
    - series-parallel, design of, 2045, (D)2901
- **Standard frequency,** (See also Frequency)
  - B.B.C. transmissions, 718
  - revised schedule of transmissions from Rugby, 1027
  - and standard time, of Funkamt, Berlin, Jan. and Feb. 1952, 2548
  - and time signals, transmissions from I.E.N., Turin, 2261
  - transmissions from Rugby and Droitwich, reports of actual values, 1658
- **Standardization,** of technical terms and circuit presentation, 2098
- **Standards,** (See also individual subjects)
  - electrical, accuracy of measurement of, 1952
  - French, C92-120, on battery-operated receivers, 3221
  - I.R.E., on gas-filled radiation counter tubes, definitions of terms, 1952, 3207, methods of testing, 1952, 3208
  - 51 IRE 20 S2, definitions of terms for transducers, 15
  - 52 IRE 7 S1, on definitions of terms for magnetrons, 2671
  - 52 IRE 20 S1, Part 2, on definitions of terms for pulses, 2592
- **Stars,** scintillation on optical and radio wavelengths, diffraction theory of, 1283
- **Statistics,** of closest pair of triad of observations, 2545
  - errors in measurements of random time functions, 2843
- **Stratosphere,** (See also Atmosphere)
  - circulation between polar and equatorial regions in, 1600
- **Sun,** ellipsoidal form shown by m-wave observations during eclipses, 2786
  - emission of corpuscles from, and geomagnetic effects, 2494
  - general magnetic field of, measurements of, 2210
  - pulsations of diameter of, 667
- **Sunspot cycle,** correlation with solar-prominence activity, 3422
- **Sunspots,** provisional numbers, April–June 1951, 119, July–Sept. 1951, 1280, Oct.–Dec. 1951, 2495, Jan.–March 1952, 2783
  - relative numbers, final, for 1950, 118
    - forecasts for period up to 1957, 388
  - reversal of polarization of microwaves from, 2782
- **Surveying,** radio, long-distance measurements by shoran, 1610
    - using lorac system, 996
- **Switches,** electron-beam, and applications, 1476
  - electronic, using cold-cathode gas-discharge tubes, 3274
    - c.r., for communication equipment, 1173
    - using gas-filled diodes with external electrode, 1786
    - linear analysis of, 930
    - using multivibrator, 63
    - using rotating-beam valve, 64
  - rotary, high-speed, K-band, for rapid scanning, 1122
- **Switching,** in circuits including valves, analysis of, 2738
  - system, telephone, electronic, automatic, 2597
- **Synchronization,** (See also Television)
  - of LC oscillators, 1868
  - of oscillators, theory of, 2735
  - of Südwestfunk common-wave broadcasting transmitters, 2618
  - television, flywheel circuit for, 525
- **Synchronizer,** for 100-kc/s square-wave generator, 634

T

- **Telecommunications,** D.S.I.R. fundamental research on, 291
- **Telecontrol,** for aircraft and boats, 770
  - of f.m. broadcasting transmitter, 771, 1706
  - in h.v. networks, electronic equipment for, 466
  - of television receivers, 1760
- **Telegraphy,** voice-frequency, f.m. system of, 3548
    - ph.m. system of, 1100
- **Telemetry,** and carrier-current systems, for power system, 1063
  - at guided-missile test centre, 1990
  - for rockets, simultaneous a.m. and f.m. system, 1691
- **Telephone systems,** intelligibility in, objective measurements of, 2703
  - long-distance, new, in Germany, 491
  - transmission quality of, evaluation of, 1191
- **Telephony,** h.f. carrier, Montavox equipment for mining, 3549
- **Television,** (See also Aerials; Interference; Test equipment)
  - as aid to observation, 3252
  - amplifiers, negative-feedback, for cameras, 531
    - new types of, 3582
    - r.f., for u.h.f. tuner, 370
    - u.h.f., grounded-grid, 2639
    - vertical-deflection, stabilization of, 1761
    - v.h.f. and u.h.f., using coaxial tetrodes, 2175
  - build-up curve and bandwidth utilization in, 3573
  - cable system, Birmingham–Holme Moss, 2342
    - London–Birmingham, 2625
  - camera cable for, 2984
  - camera tubes for, (D)522
    - applications of secondary-emission surfaces in, 2348
    - comparison of different types, 1451
    - with concentric-sphere electrode system, 3284
    - development of, 520
    - iconoscopes and image orthicons, use as film pickup devices, 838
    - image iconoscope, electronoptical problems of, 1452, impedance changes in, 521, magnetic, paraxial image formation in, 1753, Philips Type 5854, 1754, photicon, 2632, pulsed biasing of storage surface in, 2055
    - Marconi orthicon, 523
    - storage-type, development of, 2349
    - super-iconoscope, 1755
    - survey of, 1450
    - vidicon, 1134, performance of, 2914
  - carrier-frequency transmission on cable links, 2903
  - colour, c.r. tube for reproduction of, 2354
    - and colorimetry, 825, (C)2051
    - 'crispening' circuit for, 515
    - dot-interlacing system for, 278
    - dot-sequential, analysis of, 827, band-shared systems, improvements in, 826, 1129
    - field-sequential and colour subcarrier systems, 824
    - frequency-spectrum utilization in, 829
    - kinescopes, aperture-mask, effect of screen tolerances on operation of, 852, aperture-mask, mechanical design of, 851, deflection and convergence in, 853, grid-controlled, 847, line-screen, development and operation of, 848, phosphor-screen production for, 849, principles of, 843, shadow-mask, 1-gun, 845, shadow-mask, 3-gun, 844, tricolour, moiré effects in, 3261, 45°-reflection type, 846, 3-beam guns for, 850
    - N.B.C. New York field test studio for, 2909
    - N.T.S.C. band-sharing colour-subcarrier system, general description of, 2343, plans for, 277, principles of, 1750, synchronizing signal for, 1749
    - polarized screens for, 3578
    - progress in, 2906
    - R.C.A. camera chain for, 2908
    - R.C.A. image-orthicon camera, optical system for, 2907
    - simultaneous-transmission system, requisite bandwidth for, 3247
    - test-pattern generator for, 519
    - U.S.A. standard on, 831, 1447
    - wired system for industrial application, (A)276
  - c.r. tubes, Al-backed screens for, 1455
    - characteristics of, 529
    - Davisson design, 1142
    - deflection systems for, magnetic, 2352, theory of, 528
    - design and operation of, 842
    - ion-spot problem in, 840
    - with iron envelopes, manufacturing technique for, 1790
    - with low focusing voltage, 3259
    - modulation characteristic of, 2353
    - performance of, evaluation of, 1763
    - self-focusing, 2918
    - in U.S.A., 2355

  wide-angle deflection in, 3581, yoke construction for, 2637, yoke design for, 1757
 in Denmark, and international frequency allocations, 3227
 developments in Germany, 1442
 developments in and outside Switzerland, 2345
 field-strength and picture-quality measurements round the Uetliberg, Zürich, 3254
 film-reproduction, compensation methods in, 1443
 frame output stages, theory and design of, 2060
 frame synchronization separation, time-selection circuit for, 1136
 frequency stability for offset-carrier operation, 2913
 interference, F.C.C. plan for dealing with, 2358
  from line-deflection circuits, 2641
  low-frequency, observer reaction to, 855, 1767
 line-scan and h.v. generator, single-valve, 1137
 line standards and screen dimensions, 3245
 mobile, problems in, 514
 pickup equipment, portable, 2911, 625-line, 2056
 picture detail, definition and measurement of 2921
  technique for improvement of, 828, 1444
 picture flicker, 1128
 picture line selector, 1762
 picture quality, 275, (C)1126, 1127, 2920
  effect of weather conditions on, 3584
  factors affecting, 3583
  improvement by dot arresting, 513
 projection, direct system for theatres, 3248
  large-screen, eidophor system of, 2350, in Festival of Britain telecinema, 1131
  Schmidt-type system, for theatres, 1453
 receivers, choice of i.f. in, 2058
  combination television and radio, 1090
  combined colour and black-and-white, C.B.S.-Columbia, 1758
  constant-input-impedance second detector for, 2059
  deflection systems using blocking oscillators, 2061
  discussion at I.E.E. Convention, 1952, 2633
  'English Electric', design of, 839
  faulty interlacing in, 2918
  flywheel synchronizing circuit for, 525, 3262
  focusing of c.r. tubes for, 3258
  frame deflector coils, required figure of merit of, 2917
  influence of i.f. amplifier on signal build-up in, 2062
  line-scan circuit, 527, 2916, with economy transformer, 3580
  line-scan valves and circuits, 2638
  multichannel, British, 2915
  R.C.A. Victor 630TS, description of, 1756
  reduction of line visibility by 'spot stretching', 2634
  reduction of oscillator radiation from, 3264
  remote-control systems for, 1760
  ringing-choke h.v. supply unit for, 1140
  simplification of, 3257
  timebase for, 841
  tuner, printed components in, 1139
  u.h.f. converter for, 1454, 1759, 2635, modified-butterfly-type, 524
  unit construction for, 2057
  unlicensed, detection equipment for, 3579
 reception, effect of multipath propagation in hilly country, 1765
  in fringe areas, 1457
  long-distance, 582
  pulse-interference limiters for sound channel, 3585
 relay, Calais-London, 821
  London-Birmingham, 820
  Paris-Lille, 819, 2627, equipment for, 2609, 2628
  Paris-London, July 1952, 2902, 3572
 resolution, improvement by 'velocity-modulation', (D)823, (D)2630
 scanning circuit, flying-spot, negative feedback in, 3255
  mathematical analysis of, 1441
 scanning-current linearization by negative feedback, 1752
 scanning generators, e.m., 2347
 scanning and h.v. circuits for wide-angle c.r. tubes, 2351
 signal prediction in, 2905
 signal statistics for, 2904
 signal transmission over telephone lines, 822
 standards, in Argentina, 1446
  in Belgium, 2344
  C.C.I.R., 1951, for 405-, 525-, 625- and 819-line systems, 2912, 625-line, variant of frame synchronizing sequence for, [illegible]
  50 IRE 23.S1, on measurement methods, 516
 stations, at Holme Moss, 1456
  at Kirk o'Shotts, 2640
  at Sutton Coldfield, 854
 stereoscopic, for remote control, 1130
 studio equipment, Lime Grove, B.B.C., 3249
 studio illumination for, 1132
  blue lamp for, 836
 in Sweden, 3575
 synchronizing signal, pulse-cross testing of, 1125
 synchronizing-signal generator for, automatic, 835
 systems, improvement of transient response in, 3253
 tone reproduction in, graphical assessment of, 3260
 transmission tests on coaxial cables, 1439
 transmitter, amplitude characteristics of, measurement of, 1133
  C.S.F., 3576
  development problems of, 2054
  Du-mitter for feeding groups of receivers, 2346
  R.C.A. TTU-1B and TTU-10A, 1449
  u.h.f., using coaxial-line cavities, 1448
  vision, for Sutton Coldfield station, 834
 underwater, equipment developed by Pye Ltd for Admiralty, 3250
  equipment using Marconi image-orthicon, 2053
  laboratory demonstration of, 3251
 vestigial-sideband filter for Sutton Coldfield transmitter, 626
 v.h.f.-u.h.f., service-area charts for, 3263
 video levels in, 838
 waveform, c.r.o. display unit for, 447, 741
  line-strobe monitor for, 2846
 625-line equipment demonstrated at Brussels radio and television show, 518
Temperature compensation, of moving-coil meters, by thermistors, 199
Test equipment, (See also individual subjects)
 for airborne instrument-landing receivers, 3098
 automatic circuit checker for receivers, 2860
 with compensated fluxmeter, for magnet steels, 2275
 for c.r.o. display of transistor characteristics, 2558
 for dynamic measurements on receiving valves, 2288
 for German post office broadcasting-network repeater stations, 1726
 for instrument landing system, 1685
 for measuring number of turns of coils, 1983
 for mobile-transmitter frequency, 1034
 for mobile-transmitter performance, 1054
 probe for tests on pulse circuits, 2278
 pulse-echo, for quality control of coaxial cables, 2266
 for television transmission circuits, 1043
 u.h.f., for television transmitter, 1682
 use of multivibrator in, 1668
Thermistors, Italian, performance and applications of, 58
 manufacture, properties and applications of, 688
 pressure coefficient of resistance of, 3018
 refractory, 165
 resistance variation with temperature, explanation of, 3062
 as r.f. variable resistance standards, 2134
 and semiconductors, conductivity of, 1845
 for temperature compensation of moving-coil meters, 199
Thermocouples, as a.c.-d.c. transfer standards for current and voltage measurements at a.f., 2552
Thermodielectric effect, 648
Thunderbolts, (A)[illegible]
Time signals, radio, accurate system for, 1363
  and standard frequencies, transmissions from I.E.N., Turin, 2261
Timebases, circular, slow-speed, 2755
 for precision ionospheric recorder, 2477
 use of feedback in, 2759
Timers, circular-sweep chronograph for ms intervals, 3183
 dekatron, 3485
  reading directly in terms of mains-frequency cycles, 2841
 for EDVAC digital computer, 434
 millisecond, for intervals up to 10 sec, 214, 2842
 for telephone-exchange relays, 1950
Tornadoes, identification from atmospherics waveform, 3429
Transceivers. See Transmitter-receiver.
Transducers, acoustic, reciprocity calibration of, 2689
 BaTiO$_3$, frequency response of, 1819
  for measurements on telephone switchgear, 2561
  production of, 2977
 crystal, response curves of, 890
 definitions of terms for, 51 IRE 20 S2 standard on, 15
 electroacoustic, attenuation for case of conjugate matching, 3305
  coupled, theory of, (C)2107
  investigation by repeated and retrograde re-recording, 1509
  reciprocity relations and electrical equivalents for, 571
 high-power thermionic cells as, 288
 magnetostrictive, equivalent circuit of, 1802
  ring-type, attenuation of, 3306
  simple method for constants of, 1494
 piezoelectric, for hearing aids, 16
  for ultrasonic delay lines, theory of, 2743
 quartz, maximum ultrasonic intensity attainable with, 305
Transformers, a.f., design charts for, 1216
 and chokes, for low-power rectifiers, design of, 505
  winding calculations for, 605
 conductance diagram for, 2131
 current, r.f., for milliammeters, 1847
 differential, theory of, 57
 e.s., d.c., 300-kV, rotary, 270, 503
 h.f., matching, wide-band, design of, 616
 impedance, wide-band, h.f., 3027
 line-scan, considered as pulse transformer, 1141
 low-power, charts for design of, 1527
 mean winding length of, determination of, 61
 pulse, with fast response, 3011
 reactance calculation for, 602, 2448
 small, calculation of, 606
 tuned, and filters of maximum bandwidth, 1863
 for use with Type-SSF rectifiers, resistance of, 3363
Transients, analysis by means of Laplace transformation, 3360
 in linear quadripoles, analysis of, 2146
Transistors, circuits for, design of, 1218
 c.r.o. display of characteristics of, 3184
 Ge, development and applications of, 3268
  n-p-n junction, 1168
  n-type, collector-forming effects on, 2367, with phosphorus-alloy contacts, electric forming in, 286, use of donor-alloy contacts in forming of, 1937
  and related devices, general account of, 553
  theory of noise in, 870
  type-A, current multiplication in, 2366
 noise and barrier-layer interaction in, 2928
 PbS, double-surface, 2653
 physics and construction of, 1643
 point-contact, improvement of stability of, 2652
 progress in technique of, 2365
 review of development and applications of, 2651, 3269
 use in multivibrator and flip-flop circuits, 1555
Transmission, diversity, application to teletype radiotelegraphy, 799
 and reception, common-aerial, of circularly polarized microwaves, 281, of v.h.f. waves, 538
 of signals, effect of delay distortion on waveform fidelity in, 1860
—— lines, attenuation and characteristic impedance of, measurement of, [illegible]
 branch connection of, 909
 coaxial, balancing and transformation with, 1827
  homogeneous, signal distortion in, 1194, (C)3336
  with laminated inner conductor, 2988
  as measurement instruments in dm-wave band, 1369
  minimum-dissipation tuning stubs for, 315
 coaxial and waveguide, rotating joints for, 907
 delay, BaTiO$_3$, 1231
  continuously wound, variation of phase velocity at h.f., (D)2432
  magnetostrictive, for storage system of computer, 1200
  ultrasonic, Hg, folded, design of, 620, piezoelectric transducers for, 2743, vitreous-silica, performance of, 2462
  as valve components, 2375
 flat-strip, properties and applications of, 2705
 helical, e.m. wave propagation along, 112, 660
  general theory of, 1893
 heterogeneous, propagation equations for, integration conditions for, 2706
 h.v., attenuation of carrier-frequency waves due to hoar frost, 1825
 image impedance and image attenuation of, measurement of, 1961
 inhomogeneous, theory of, Fourier transforms in, 1830
 λ/4, short-circuited, equivalent circuit for, 316, input-impedance characteristics of, 2430
 Lecher-wire, matching-stub chart for, 1515
 lossy, operating parameters at dm and m λ, 3349
 measurement of group-propagation-time differences on, 1373
 as models for study of e.m. wave propagation, 2316
 with periodic structure, properties of, 3615
 phase distortion in, measurement of, 208
 radial, theory of, application to horns, 29
 RC and LG, pulse distortion in, 578
 resonant, mismatched, reactance of, 321
  radiation resistance of, 2987
 r.f., and waveguides, survey of, 1195
 single-wire, magnetically loaded, 908
 steady-state waves on, 2989
 surface-wave, corrugated, experimental investigation of, 33
  cylindrical, 579
  e.m. propagation along, 317, (D)3339
  interaction between, 3340
  single-conductor, 3338
 transients on, application of operational calculus to, 2112
 u.h.f., twisted-pair, flexible, 2113
 uniform, standard equations for, simple derivation of, 3341
 and waveguides, characteristic parameters of, 31
 2-wire, radiation resistance of, 577
Transmitter-receiver, R/T, portable, 30–50-Mc/s, Type SUF-21K, 2898
Transmitters, (See also Television)
 amateur, use of Π networks for reduction of television interference from, 2359
  10–160 Mc/s, television-interference-free, 1458
 broadcasting, a.m., delay limiter for, 539
  C.F.T.H., latest types of, 3587
  f.m., high power, (D)534
  German, list of, 499
  for international shared frequencies and new Danish f.m. stations, [illegible]
  medium-wave, 100-kW, at Kalundborg, Denmark, 1736, 150-kW, 3588
  Südwestfunk, problems of automatic operation of, 2648
  twin drive as active reserve for, 2645
  6–24 Mc/s, 40-kW, 1461
  2 x 20-kW, Ravensburg, 2644
  100-kW, Villebon, Paris, 2361
  150-kW, Daventry, remote control of, 2924
 f.m., for mobile police communications, 3265
 for m.f., h.f. and v.h.f. bands, 100-W and 150-W, 2064
 power/load curves and matching range of, 2362
 R/T, s.s.b., multichannel, LD-T2, 2065
  4–23-Mc/s, with servo-operated push-button tuning, 2922
 suppression of harmonics in, (C)2063
 s.w., for civil-aviation service, 1768
  use of overtone crystal oscillator for prevention of interference with television, 856
 v.h.f., parasitic emissions from, 3497
 8-channel, for wire-broadcasting system, 798
Transmitting station, F8REF, for transmissions to French amateurs, 3237
 radio, Italcable, at Torrenova, 1433
Tropicalization, a colonial's ideas on, 3145
 principles and methods of, 176
Troposphere, (See also Atmosphere)
 electrical conductivity of, 1289
 inversion layers in, effective height of, 476
 temperature profile in, theory of, 393

U

Ultrasonic absorption. See Absorption.
 applications, cleaning of small metal parts, 3190
  determination of properties of road materials, 3514
  flaw-detection equipment, 751
  making of holes in hard materials, 1988
  measurement of elastic constants, 3189
  thickness gauge, 455, 3513
  tyre-testing equipment, 1687
 oscillations, generation by means of magnetostrictive powders, 1183
Ultrasonics, in air, and applications, 6
 attenuation in Ni and Fe-Si single crystals, 169
 beam power measurement, 3313
 cavitation production, theory of, 1804
 energy concentration in, 3309
 magnetically induced velocity changes in multicrystal Ni, 2818
 measurements on liquids, 563, 2967
 use of phosphorescent materials as detectors in, 1810
Units, rationalized M.K.S. system, 659

V

Vacuum gauges, adsorption manometer for pressures $< 10^{-7}$ mm Hg, 2520
  ionization, calibration of, 1004, for measuring contamination time, 2229, for mounting in main pumping line, 2229, notes on, 1927
  Knudsen, description and theory of, 3101
  Knudsen-type, automatically controlled, 2817
  Penning, calibration and use of, 3102
  thermocouple micromanometer, 3103
 technique, and application in radio and electronics, 1928
  applications of ultraviolet absorption in, 419
  evaporation equipment with high pumping speed, 2240
  molecular flow in connected tubes, 684
  use of getters in, 2521
Valves, (See also Counter tubes; Discharge tubes; Transistors)
 amplifier, microwave, optimum geometry of, 2377
  penetration-factor determination for, 3285
 balitron, circuits using, 2388
 characteristics, c.r.o. comparator for, 2854
  c.r.o. display of, 1677, 1678
 cold-cathode, dekatron, single-pulse, for counters, 1787
  as switching devices, 3274
 counter, decade, ribbon-beam, for high counting rates, 3614
 crystal, diode, characteristics in mV region, 3296
  Ge-diode, effect of magnetic field on, 3604, in SEAC computer, performance data for, 2385, time lag of forward conductance of, 3282, use in indicating instruments and relays, 3283
  Ge diode and triode, characteristics and applications of, 1785
  Ge-W diode, temperature-independent, 2943
  tabulated data of available types, 2395
 diode, cylindrical, transit-time effects in, 1784
  damper, for television horizontal-deflection circuit, 551
  electron transit time in, influence of initial velocities on, 1783
  planar, electron streams in, 1164, ions and electrons with uniform initial velocities in, 2649, space charge and transit time for relativistic velocities, 2383, space-charge smoothing factor for, (D)1163, transient response of, 2386
  with plane inclined electrodes, theoretical investigation of, 2384
  potential distribution in, calculation of, 1162, and I/V_a curve for, calculation of, 2084
  potential distribution and transit time as functions of current in, 2382
  with retarding field, admittance of, 3605
 double-beam, for amplification at 3 kMc/s, 1154
 electron-beam, modulated, effect of velocity distribution in, 3289
  oscillator, upper frequency limit for, 3618
 electron-wave, theory of, 2077
 glow-discharge, voltage-regulator, mean-noise characteristics of, 2931, peak-noise characteristics of, 2930
 grid-controlled, oscillation-frequency limits of, 83
 grid current in, tests for, 1166
 for high-efficiency line-scanning circuits, 2638
 high-power, with squirrel-cage filaments, magnetron effect in, 3606
 high-transconductance, using space-charge deflection of beam, 1477
 investigation by use of radioactive isotopes, 1782
 klystron, amplifier, wide-band, 5-kW, 557
  effects of grid-mesh dimensions on performance of, 878
  equivalent circuits for, 1481
  high-power, recent developments in, 2393, for u.h.f. television, 558
  power-amplifier, Type SAL30, 2092
  recent developments in, 2090
  reflex, electron oscillation in, 879, for mm waves, 2394, operation in f.m. microwave links, 2895, space-charge effects in, 1177, Type KR142, 8·45–10·3 cm, with fixed load, 2392
  travelling-wave, duplex, 2091
  9·3-kMc/s, for transmitters of air-navigation systems, 1482
 klystron and travelling-wave, noise in, 2372
 and lamps, mass production of bulbs for, 3281
 magnetron, for a.m. transmitters, injection locking of, 3047
  as amplifiers, theory of, 2669
  axial-anode, in condition of static space charge, 877
  cut-off characteristic and potential distribution of, 2089
  in cut-off condition, experimental study of, 3620, theory of, 3619
  cylindrical, smooth-anode, instabilities in, 3293
  definitions of terms for, 52 IRE 7S1 standard on, 2671
  development in Germany up to 1945, 2951
  for dielectric heating, 3292
  with few segments, experimental study of, 2950
  f.m. of in dm-λ range, 3294
  inverted, 3621
  as microwave amplifier, 1479
  mm-wave harmonics of, 2478
  multisegment, potentials and electron paths in, 2952
  planar, theory of, 1478
  pulsed, r.f. phase control in, 2670
  split-anode, decelerating effect in, 1480
  as travelling-wave valve, 289
  whole-anode, influence of secondary emission in, 1791
  tables for f.m., 3295
 manufacture of, Brimar grid-winding lathe for, 2941
  use of rare metals in, 1150
 microphony in, measurement of, 1773
 microwave, ξ, η tables for exponential part of i_a/V_a characteristic of, 2376
  symbolism for classification of, (A)2858, 3598
 oscillators, mm-λ, review of, 2946
 oxide-cathode, characteristics of, changes of, (A)3599
  loss of emission in due to shock, 2663
  space-current changes following small current pulse in, 2078
 pentode, Types PTT 216 and 214, for wide-band amplifiers, 3288
 performance analysis for large signal voltages, (C)865
 reactance, space-charge effects in, 2947
 receiving, for electrometer use, 541
 reliable, manufacturing and testing techniques for, 1776
 reliability of, J.E.T.E.C. report on, 863
 resnatron, reflex, for u.h.f. television, 3617
  u.h.f., new designs and applications of, 555
 retarding-field, experimental investigation of theory of, 2949
 secondary emission, with MgO emitters, 3003
 for Services, quality and reliability standards for, 1777
 switching, ribbon-beam, 1789, principles and applications of, 2389
 tetrode, beam, power, I/V characteristics of, 3611

space-charge and ion-trapping effects in, **1170**
transmitting, effect of electron transit-time on efficiency of, **3612**
thyratron, deionization time of, statistical and physical concepts of, **2387**
grid-voltage peak in, **875**
high-current, Type GL-5855, **874**
initial conduction interval in, **3608**
as relays, **929**
transmitting, heat-transfer data for, **1774**
high-power, cooling by vaporization of water, **542, 2074,** use of Th-W filaments in, **2660**
large, water jacket for, **1473**
travelling-wave, delay lines in, theory of, **2375**
effect of electron-velocity spread on gain and noise figure of, **1151, 2934**
electronic wave attenuation in, **545**
gain calculations for, **544**
with helix, optimum amplification in, **2374**
internal-feedback, **2373**
magnetron as, **289**
miniature, **866**
noise figure of, **543, 546, 1470,** calculation of, **3276, 3597**
noise and gain measurements on, **1152**
periodic-waveguide, medium-power, **1153**
as phase modulators and frequency changers, **1463**
for radio beam links, **2894, 2935**
without retarding line, **2075**
spatial-harmonic, for 6-mm λ, **547**
theory of, **106**
Type M8, impedance matching to waveguide, **2940**
Types M8 and M11, electron guns for, **2938,** impedance matching to coaxial lines, **2939,** measurements and characteristics for, **2937,** technical development of, **2936**
oscillator, u.h.f., wide-band, **3616**
travelling-wave-type, with wide-band interdigital delay structures, [redacted]
triode, crystal, **1167**
disk-seal, transit-time oscillations in, **2664**
inverted, properties and applications of, **2263**
microwave, amplification factor of, **3287**
planar, calculation of families of characteristics for, **3609,** effective grid potential and cathode current density of, **2085,** transconductance calculation from theory of potential, [redacted]
planar and cylindrical, penetration factor of, **1474**
transit-time reduction in, **871**
transmitting, high-power, h.f., Type-F-5918, manufacture of, **1169**
Type-ML5681, for 50-kW output up to 110 Mc/s, **3610**
u.h.f., cylindrical, amplification factor of, **3607,** planar, amplification factor of, **552**
for 100–420 Mc/s, **2086**
triode and tetrode, for coaxial-cable system, **1165**
power, u.h.f., **3286**
u.h.f., review of, **3291**
v.m., space-charge waves on retarded stream in, **2666**
variation of h.f. power with d.c. power, **2391**
for 100-1000 W continuous output, **2953**
Vibrations, forced, nonlinear, theory of, **1881**
of rods, damping by surrounding medium, **615**
Voltage divider, capacitive, wide-range, **1974**
potentiometer measurement of, errors in, **203**
Voltmeters, a.c., a.f., frequency compensation of, **202**
differential, using temperature-limited diode, **3501**
diode, response to randomly recurrent impulses, **736, (C)1670, 1973**
indicating, discrete-digit, 'anodige', **3178**
'Stromdämmung'; German term for 'ohms per volt', **1375**
valve, without calibration drift, **1041, 1376**
double-diode rectifier circuit for, **1671**
r.m.s., **3502**
slideback and infinite-impedance types of, **1672**
Type-TVL25, 3 V–30 kV, **3503**
Volume compression, automatic, electronic, **2152**

W

Wattmeters, electronic, for ranges 0–71 kc/s and 0·50 W, **1982**
Wave mechanics, relativistic relations between wave parameters, **2766**
Wave propagation, acoustic, (See also Sound)
and concept of group velocity, **2179**
in duct with constrictions, **1492**
in ducts coupled end to end, analysis of, **1258**
in medium with very small random variations of refractive index, **885**
of spherical compressional waves in solids, **2410**
in 3-layered liquid half-space, **1490**
acoustic and e.m., directive, correlation function in analysis of, **882**
scattering by two or more parallel cylinders, **2685**
Wave propagation, e.m., (See also Field strength; Reception; Television: Transmission lines; Waveguides; Waves)
in anisotropic media, **2007**
anomalous, in 1–10-m band, **1409, (C)2012**
in artificial dielectrics, effect of magnetic field on, **1587**
in atmospheric duct, **1402**
attenuation due to scattering, **(D)1716**
characteristic impedance of free space, **3419**
cm-λ, in northern France, **3218**
in optical range, **789**
concept of group velocity in, **3420**
in conical horn, laws of, **3356**
in cylindrical waveguides, theory of, **320, 915**
in dielectric plates, cut-off frequency for, **1895**
from dipole over earth's surface, **467**
of discontinuities in e.m. field, **1709**
over earth's surface, analysis of, **591**
fade-out statistics for 1949, **1087**
fading, on clear nights, of microwaves, **1413**
rapid variations of s.w. signals, **1088**
of 50-Mc/s signals reflected from aurora borealis, **2876**
of 3-cm waves over 10·6-mile sea path, **1717**
field-strength measurements, near land/sea boundary, **2013**
of WWV 10-Mc/s signals at Turin, **477**
at 412 Mc/s, **788**
forecasts, for N. Pacific and Alaskan areas, **2573**
ground wave, analysis of, **777**
along helical conductor, **112**
in heterogeneous layers, **2312**
beyond horizon, in range 40 Mc/s–4 kMc/s, **3216**
over horizontally stratified earth, **1585**
'internal' reflection in stratified medium, **236**
ionospheric, cross-modulation in, **474**
and in crystals, double refraction in, **2868**
effects of solar eclipse on, **2575**
field-strength calculations for reflected waves, **2318**
forecasts, comparison with observations, **(D)2574**
at frequencies near 100 kc/s, over distances up to 1000 km, **(A)2578, 3534,** over short distances, **(A)2577, 3533**
group velocities and group heights from magneto-ionic theory, **1405, (C)2009**
gyro-interaction in, **785, 2011,** experimental determination of resonance curve in, **2010,** resonance in, **3214**
and gyro-interaction, investigation by means of models, **470**
influence of geomagnetic field on, **781**
at oblique incidence, **472,** and Lorentz polarization term, **1302,** of km waves, **2873**
path analysis for, **1083**
path calculation for, **782**
phase path determination for, **2315**
II wave and coupling factor in theory of, **1403**
predictions, by Spanish method, **3536,** of optimum working frequencies for any range, **1404**
production of harmonics at points of zero dielectric constant, **1081**
solution for reflected long waves, **137**
and space-wave reception, **780**
time-delay measurements at medium frequencies, **473, (D)1714**
at vertical incidence, theory of, **243**
v.h.f., long-distance, **2581**
over irregular surface, integral-equation solution for, **2311**
jumps in discontinuous solutions of wave equation, **1708**
from land to sea and vice versa, **1711**
lateral deflection of waves reflected by inhomogeneous layer, **244**
l.f., effect of ionospheric storms on, **246**
in lower atmosphere, average ray refraction in, **2576**
magneto-ionic theory, matrix and tensor form of fundamental relations of, **3416**
wave polarization chart for, **2572**
microwave, asymptotic solutions of differential equation in theory of **1710**
m-λ, beyond horizon, and atmospheric conditions, **241, 242**
behind a mountain, **3531**
between New York and Amsterdam, correlation with geomagnetic activity, **3213**
in nonhomogeneous atmosphere, theory of, **661**
oblique-incidence measurements over 1150-km path, **3530**
phase and group paths of waves returned from E layer, **397**
phase variations of c.w. signals in 70–130-kc/s band, **2583**
as a function of distance, **2582**
polar blackouts recorded at Kiruna observatory, **783**
polarization, of l.f. ionosphere echoes, **2874, 2875**
of 3·6-Mc/s ionosphere echoes, **2867**
problems of, application of compensation theorem to, **591**
reflection, in slightly inhomogeneous layers, **2006**
via triangular path, **2314**
round-the-world signals, **3535**
scatter-sounding methods of prediction of h.f. transmission, **2579**
over sea path, at 33 Mc/s, **787**
Sommerfeld's surface wave, **468, 469**
source of long-distance backscatter in, **1082**
along surface of dielectric-coated conductor, **30**
along surface of dielectric cylinder surrounded by dielectric, **662**
s.w., and effect of planetary configurations, **3212**
ionospheric, effect of geomagnetic field on, **778**
transatlantic, variation of angle of arrival with phase of sunspot cycle, **475**
WWV forecasts for, **3215**
transient, in conducting medium, **1586**
transmission-line models for study of, **2316**
tropospheric, beyond horizon, **1408**
theory of scattering in, measurement of parameters involved in, **1411**
u.s.w., abnormal ranges and their meteorological causes, **2580**
effective height of troposphere inversion layers in, **476**
and meteorological influences, **3217**
v.h.f., **1712, 1736**
via sporadic-E clouds, **1084**
wave packets, Poynting vector, and energy flow in, **1274**
at 16 kc/s, explanation in terms of two layers below E layer, **2804**
over distances of 200 km, **2870**
over distances of 540 km, **2871**
at 30–100 Mc/s, **1085**
at 4 kMc/s, pulse investigation of, **1414**
in 5-m waveband, statistics for ranges beyond optical limits, **2319**
Waveform, (See also Analysis)
analysis, using autocorrelation functions, **797**
for odd harmonics up to eleventh, **1374**
recording, magnetic, boundary-displacement, **1963**
television, display unit for, **447, 741**
Waveguides, branch connection of, **909**
with capacitive pins, as microwave λ/4 plate, **3348**
circular-section, inhomogeneous, e.m. waves on, **1831**
with many beams, theory of space-charge waves in, **911**
open-ended, asymmetrical waves in, theory of, **318, 319**
rotating joints for, **907**
with slot couplings, dispersion in, **2712**
susceptance of thin iris for TM_{01} waves, **1513**
transmission characteristics of, **2992**
transmission of TE_{01} waves round bends in, **3345**
u.h.f. propagation in, **581**
completeness of system of E- and H-type waves in, **2433**
corrugated, experimental investigation of, **33**
diaphragms in, properties of, **1197**
dielectric-rod, with image plane, **2994**
measurement of λ and attenuation in, **1965**
evanescent waves in, refraction of, **34**
Faraday rotation in, **2710**
generalized telegraphy equation for, **2709**
h.f., relative power-carrying capacity of, **1196**
horn, propagation in, theory of, **320, 915**
inhomogeneously filled, propagation constants of, **2114**
junctions, hybrid, short-slot, **1833**
loss-free, completeness relations for, **3347**
offset, as reactive elements, **910**
multilayered, field expansion in normal modes for, **2993**
with nonuniform cross-section, elimination of reflections in, **1832**
phase changer for, errors in, **2711**
principle of limiting absorption in, **3344**
rectangular, chart for cut-off frequency of, **1514**
coupling by large apertures, **2473**
diaphragms in, and band-pass filters, **3346**
impedance of strips in, **(A)2434, 2707**
magneto-optics of electron gas in, **912, (C)913, 914**
susceptance of symmetrically placed inductive posts in, **2991**
u.h.f. propagation in, **35**
reflectionless termination for, **1674**
reflections at dielectric in, **32**
and r.f. transmission lines, survey of, **1195**
single- and multi-iris resonant structures in, **2708**
slotted sections for cm-wave measurements, **1372**
square-section, abac for TM_{11}-mode attenuation in, **1836**
systems with negative phase velocities, **3342**
and transmission lines, propagation parameters for, **31**
Wavemeters, (See also Frequency meters)
cavity-resonator, for cm waves, design of, **744**
Waves, (See also Diffraction; Sound)
acoustic and e.m., scattering by parallel cylinders, **1803**
a.f., complex, measurement of mean power of, **2688**
elastic, longitudinal, in isotropic cylinders and slabs, **884**
electro-magneto-ionic, relativistic theory of, **105**
e.m., amplified, in ionized medium, Bailey's theory of, **1593**
guided, systems of linear equations in theory of, **1582**
h.f., with signal and random-noise modulation, energy distribution in, **802, 2333, 2891**
Huyghens' principle for, analytical expression of, **1584**
interaction within matter, **2206**
ionospheric scattering of, **779**
longitudinal and transverse, in moving plasma, **383**
plane, inhomogeneous, properties of, **113,** scattering by soft spheres and cylinders, **3397**
and plasma, **971**
scattered, cross polarization of, **3537,** volume-integral equation for, **1412, (C)2586**
scattering of, by cylinders, spheroids and disks, **1261,** by two concentric spheres, **1259**
short, effective velocity of, **471**
slow, production of, **1829**
surface, along dielectric-coated conductor, **30,** along dielectric-coated dielectric cylinder, **662,** on magnetically loaded wires, theory of, **908,** theoretical proof of existence of, **2704**
surge, parameters and operation constants of, **3488**
total reflection with reflection of evanescent wave, **967**
velocity determination, by cavity-resonator method, errors in, **1243,** by microwave interferometry, **2313, 3532**
very-low-frequency, reflection at sharply bounded ionosphere, **786**
Zenneck ground wave, **773**
magneto-hydrodynamic, in gases, **3412**
multiple scattering of, **1578**
ultrasonic, attenuation of, in Ni and Fe-Ni, effect of magnetic field on, **1805**
reflection and scattering by polycylindrical surfaces, **6**
in solids, measurement of attenuation of, **2099**
transmission through thin plate immersed in liquid, **2409**
velocity and absorption in CO_2 and C_2H_4 near critical point, **3310**
velocity in water under high pressure, **1811**
visual observation of, **562**
Wires, fine, for telecommunication apparatus, testing of, **717**

X

X-ray tubes, for medical applications, **1175**

ERRATA

In "Abstracts and References" throughout the year

Abstract	No.	86	In title, for 'Amplitude-Controlled' read 'Volume-Control'.
„	„	563	For '534.321.91-14' read '534.321.9-14'.
„	„	629	Cancel 655.3.
„	„	665	For '656' read '665'.
„	„	674	For '551.510.535.621.3.087.4' read '551.510.535 : 621.3.087.4'.
„	„	745	For 'T. S. Eader' read 'H. H. Davids'.
„	„	783	In last line, for 'nterest' read 'interest'.
„	„	899	In line 9, for 'with' read 'within'.
„	„	906	For '534.232' read '621.395.61/62'.
„	„	1063	For 'G. K. Duff' read 'C. K. Duff'.
„	„	1779	For '1789' read '1779'.
„	„	1941	For '546.831.824-31' read '546.431.824-31'.
„	„	2447	For 'J. Deschanps' read 'J. Deschamps'.
„	„	2570	For 'G. Leibmann' read 'G. Liebmann'.
„	„	2577	For 'R. Stuart' read 'R. D. Stuart'.
„	„	2578	For 'R. Stuart' read 'R. D. Stuart'.
„	„	2648	For 'E. Kneil' read 'E. Kniel'.
„	„	2690	For '2455 of 1951' read '2455 of 1941'.
„	„	2752	In line 4, for '/2' read 'λ/2'.
„	„	2828	For 'G. J. van den Berg' read 'C. G. van den Berg'.
„	„	2993	In title, for 'Norma' read 'Normal'.
„	„	3027	Insert 'H. Meinke' as author.

U.D.C. Changes

Aerial testers	621.392 : 621.396.67
Photocell electron multipliers	621.383.27
Power supply	621.311.6 and subdivisions
Q meters	621.317.737
Synchrotrons	621.384.612
Thermistors	621.316.86 : 537.312.6
Transistors	621.314.7

LIST OF JOURNALS

A selection of the journals which are regularly scanned is given below, together with the addresses of publishers or editorial offices and the abbreviations of titles as used in the Abstracts and References. Applications for copies of any journal should be made to the addresses given.

The full title of each journal is given first and is followed by the address, the abbreviated title being shown within parentheses. In a few cases the nature of a journal is indicated, where neither the title nor the address shows it clearly.

A

Acta Polytechnica, Royal Swedish Academy of Engineering Sciences, Stockholm, Sweden. (*Acta polyt., Stockholm*)

Acta physica austriaca, Springer Verlag, Wien I, Mölkerbastei 5, Austria. (*Acta phys. austriaca*)

Acustica, S. Hirzel Verlag, Zürich, Switzerland. (*Acustica*)

Advances in Physics, Taylor & Francis Ltd, Red Lion Court, Fleet Street, London, E.C.4, England. (*Advances Phys.*)

Alta Frequenza, Associazione Elettrotecnica Italiana, Milano (202), Via S. Paolo 10, Italy. (*Alta Frequenza*)

Annalen der Physik, J. A. Barth, Leipzig C1, Salomonstrasse 18B, Germany. (*Ann. Phys., Lpz.*)

Annales de Physique, Masson & Cie, 120 Boulevard Saint-Germain, Paris 6e, France. (*Ann. Phys., Paris*)

Annales de Radioélectricité, 10 Rue Carducci, Paris 19e, France. (*Ann. Radioélect.*)

Annales des Télécommunications, 24 Rue Bertrand, Paris 7e, France. (*Ann. Télécommun.*)

Annali di Geofisica, Istituto Nazionale di Geofisica, Citta universitaria, Roma, Italy. (*Ann. Geofis.*)

Applied Scientific Research, Martinus Nijhoff, Lange Voorhout 9, The Hague, Holland. (*Appl. sci. Res.*)

Archiv der elektrischen Übertragung, S. Hirzel Verlag, Stuttgart, Germany. (*Arch. elekt. Übertragung*)

Archiv für Elektrotechnik, Springer Verlag, Heidelberg, Neuenheimer Landstrasse 24, Germany. (*Arch. Elektrotech.*)

Archiv für Meteorologie Geophysik und Bioklimatologie, Series A, Springer Verlag, Wien I, Mölkerbastei 5, Austria. (*Arch. Met., Wien*)

Archiv für technisches Messen, R. Oldenbourg Verlag, München, Lotzbeckstrasse 2b, Germany. (*Arch. tech. Messen*)

Arkiv för Fysik, published for Royal Swedish Academy of Sciences by Almqvist & Wiksells Boktryckeri A.B., Stockholm, Sweden. (*Ark. Fys.*)

A.S.T.M. Bulletin, 1916 Race Street, Philadelphia 3, Pa, U.S.A. (*ASTM Bull.*)

Audio Engineering, Radio Magazines Inc., 10 McGovern Avenue, Lancaster, Pa, U.S.A. (*Audio Engng*)

Australian Journal of Applied Science, Commonwealth Scientific and Industrial Research Organization, 314 Albert Street, East Melbourne C2, Australia. (*Aust. J. appl. Sci.*)

Australian Journal of Scientific Research (Series A), 314 Albert Street, East Melbourne C2, Australia. (*Aust. J. sci. Res., Ser. A*)

A. W. A. Technical Review, Amalgamated Wireless (Australasia) Ltd, Sydney, Australia. (*A.W.A. tech. Rev.*)

B

B.B.C. Quarterly, British Broadcasting Corporation, 35 Marylebone High Street, London, W.1, England. (*B.B.C. Quart.*)

Beama Journal, British Electrical and Allied Manufacturers' Association, 36 Kingsway, London, W.C.2, England. (*Beama J.*)

Bell Laboratories Record, 463 West Street, New York 14, N.Y., U.S.A. (*Bell. Lab. Rec.*)

Bell System Technical Journal, American Telephone and Telegraph Company, 195 Broadway, New York 7, N.Y., U.S.A. (*Bell Syst. tech. J.*)

British Journal of Applied Physics, 47 Belgrave Square, London, S.W.1, England. (*Brit. J. appl. Phys.*)

Brown Boveri Review, A. Francke A.G., Bern, Switzerland. (*Brown Boveri Rev.*)

Bulletin de l'Académie des Sciences de l'U.R.S.S., (*a*) série physique, (*b*) série géophysique, (*c*) classe sciences techniques, Academy of Sciences, Moscow, U.S.S.R. (In Russian.) (*Bull. Acad. Sci. U.R.S.S.,* (*a*) *sér. phys.,* (*b*) *sér. géophys.* (*c*) *tech. Sci.*)

Bulletin of the American Meteorological Society, Executive Secretary, 3 Joy Street, Boston 8, Mass., U.S.A. (*Bull. Amer. met. Soc.*)

Bulletin de l'Association suisse des Électriciens, S.A. Fachschriften-Verlag & Buchdruckerei, Stauffacherquai 36–40, Zürich 4, Switzerland. (*Bull. schweiz. elektrotech. Ver.*)

Bulletin de la Société française des Électriciens, 8–14 Avenue Pierre Larousse, Malakoff (Seine), France. (*Bull. Soc. franç. Élect.*)

Bulletin technique de la Suisse romande, F. Rouge & Cie, Lausanne, Switzerland. (*Bull. tech. Suisse rom.*)

C

Câbles & Transmission, Sotelec, 16 Rue de la Baume, Paris 8e, France. (*Câbles & Transm.*)

Canadian Journal of Physics, National Research Council, Ottawa, Canada. (*Canad. J. Phys.*)

Chalmers tekniska Högskolas Handlingar, N. J. Gumperts Bokhandel, Göteborg, Sweden. (*Chalmers tek. Högsk. Handl.*)

Communication News, Philips Telecommunications Industries, Hilversum, Holland. (*Commun. News*)

Communications on Pure and Applied Mathematics, Interscience Publishers Inc., 250 Fifth Avenue, New York 1, N.Y., U.S.A. (*Commun. pure appl. Math.*)

Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences, Gauthier-Villars, Quai des Grands Augustins 55, Paris, France. (*C. R. Acad. Sci., Paris*)

Comptes Rendus (Doklady) de l'Académie des Sciences de l'U.R.S.S., Academy of Sciences, Moscow, U.S.S.R. (In Russian.) (*C. R. Acad. Sci. U.R.S.S.*)

D

Deutsche Elektrotechnik, Verlag-Technik G.m.b.H., Berlin N.W.7, Unter den Linden 12, Germany. (*Deutsche Elektrotech.*)

E

Electrical Communication, International Telephone and Telegraph Corporation, 67 Broad Street, New York 4, N.Y., U.S.A. (*Elect. Commun.*)

Electrical Engineering, Journal of the American Institute of Electrical Engineers, 500 Fifth Avenue, New York 36, N.Y., U.S.A. (*Elect. Engng, N.Y.*)

Electrical Manufacturing, 1250 Sixth Avenue, New York 20, N.Y., U.S.A. (*Elect. Mfg*)

Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, England. (*Elect. Times*)

Electrician, Bouverie House, 154 Fleet Street, London, E.C.4, England. (*Electrician*)

Electronic Application Bulletin, N.V. Philips Gloeilampenfabrieken, Eindhoven, Holland. (*Electronic Applic. Bull.*)

Electronic Engineering, 28 Essex Street, London, W.C.2, England. (*Electronic Engng*)

Electronics, 99–129 North Broadway, Albany 1, N.Y., U.S.A. (*Electronics*)

Elektrotechnik. See Deutsche Elektrotechnik.

Elektrotechnik und Maschinenbau, Journal of the Elektrotechnischer Verein Österreichs, Springer Verlag, Wien I, Mölkerbastei 5, Austria. (*Elektrotech. u. Maschinenb.*)

Elektrotechnische Zeitschrift, Edition A & B, VDE-Verlag G.m.b.H., Wuppertal-Elberfeld, Brillerstrasse 99, Germany. (*Elektrotech. Z.*)

Endeavour, Imperial Chemical Industries, Nobel House, Buckingham Gate, London, S.W.1, England. (*Endeavour*)

Engineer, 28 Essex Street, London, W.C.2, England. (*Engineer, Lond.*)

Engineering, 35 & 36 Bedford Street, London, W.C.2, England. (*Engineering, Lond.*)

Ericsson Review, Stockholm 32, Sweden. (*Ericsson Rev.*)

F

Fernmeldetechnische Zeitschrift, Vieweg & Sohn, Braunschweig, Burgplatz 1, Germany. (*Fernmeldetech. Z.*)

FM-TV. See Radio Communication.

Frequenz, Schiele & Schön, Berlin S.W.29, Boppstrasse 10, Germany. (*Frequenz*)

Funk und Ton, Verlag für Radio-Foto-Kinotechnik G.m.b.H., Berlin-Borsigwalde, Eichborndamm 141–167, Germany. (*Funk u. Ton*)

G

G.E.C. Journal, General Electric Company, Magnet House, Kingsway, London, W.C.2, England. (*G.E.C. J.*)

G.E.C. Telecommunications, General Electric Company Ltd, Coventry, England. (*G.E.C. Telecommun.*)

General Electric Review, General Electric Company, 1 River Road, Schenectady 5, N.Y., U.S.A. (*Gen. elect. Rev.*)

General Radio Experimenter, General Radio Company, 275 Massachusetts Avenue, Cambridge 39, Mass., U.S.A. (*Gen. Radio Exp.*)

H

Helvetica Physica Acta, Journal of the Société suisse de Physique, Éditions Birkhäuser, Bâle, Switzerland. (*Helv. phys. Acta*)

HF, 55 Rue Defacqz, Brussels, Belgium. (*HF, Brussels*)

I

Indian Journal of Physics, (and Proceedings of the Indian Association for the Cultivation of Science), 210 Bowbazer Street, Calcutta, India. (*Indian J. Phys.*)

J

Journal of the Acoustical Society of America, American Institute of Physics, 57 East 55th Street, New York 22, N.Y., U.S.A. (*J. acoust. Soc. Amer.*)

Journal of Applied Physics, American Institute of Physics, 57 East 55th Street, New York 22, N.Y., U.S.A. (*J. appl. Phys.*)

Journal of Atmospheric and Terrestrial Physics, Pergamon Press Ltd, 2–5 Studio Place, Kinnerton Street, London, S.W.1, England. (*J. atmos. terr. Phys.*)

Journal of the British Institution of Radio Engineers, 9 Bedford Square, London, W.C.1, England. (*J. Brit. Instn Radio Engrs*)

Journal of the Franklin Institute, Prince and Lemon Streets, Lancaster, Pa, U.S.A. (*J. Franklin Inst.*)

Journal of Geophysical Research, Johns Hopkins Press, Baltimore 18, Maryland, U.S.A. (*J. geophys. Res.*)

Journal of the Indian Institute of Science, Indian Institute of Science, Bangalore 3, India. (*J. Indian Inst. Sci.*)

Journal of the Institution of Engineers, Australia, Science House, Gloucester & Essex Streets, Sydney, Australia. (*J. Instn Engrs, Aust.*)

Journal of Mathematics and Physics, Massachusetts Institute of Technology, Cambridge 39, Mass., U.S.A. (*J. Math. Phys.*)

Journal of the Institute of Navigation, 50 Albemarle Street, London W.1, England. (*J. Inst. Nav.*)

Journal of the Optical Society of America, American Institute of Physics, 57 East 55th Street, New York 22, N.Y., U.S.A. (*J. opt. Soc. Amer.*)

Journal de Physique et le Radium, 12 Place Henri-Bergson, Paris 8e, France. (*J. Phys. Radium*)

Journal of Research of the National Bureau of Standards, U.S. Government Printing Office, Washington, D.C., U.S.A. (*J. Res. nat. Bur. Stand.*)

Journal of Scientific Instruments, 47 Belgrave Square, London, S.W.1, England. (*J. sci. Instrum.*)

Journal of the Society of Glass Technology, Secretary, J. H. Partridge, Elmfield, Northumberland Road, Sheffield 10, England. (*J. Soc. Glass Tech.*)

Journal of the Society of Motion Picture and Television Engineers, 40 West 40th Street, New York 18, N.Y., U.S.A. (*J. Soc. Mot. Pict. Televis. Engrs*)

Journal of the Television Society, 164 Shaftesbury Avenue, London, W.C.2, England. (*J. Televis. Soc.*)

M

Marconi Review, Marconi House, Chelmsford, England. (*Marconi Rev.*)

Materials and Methods, Reinhold Publishing Corporation, 330 West 42nd Street, New York 36, N.Y., U.S.A. (*Mater. & Meth.*)

Metal Industry, Louis Cassier Company Ltd, Dorset House, Stamford Street, London S.E.1, England. (*Metal Ind., Lond.*)

Metal Progress, American Society for Metals, 7301 Euclid Avenue, Cleveland 3, Ohio, U.S.A. (*Metal Progr.*)

Metal Treatment, [illegible] Wellington Street, London, W.C.2, England. (*Metal Treatm.*)

Metallurgia, Kennedy Press Ltd, 21 Bedford Street, London, W.C.2, England. (*Metallurgia, Manchr*)

Meteorological Magazine, Her Majesty's Stationery Office, York House, Kingsway, London, W.C.2, England. (*Met. Mag., Lond.*)

Microtecnic, Lausanne, Switzerland. (*Microtecnic*)

Modern Plastics, 122 East 42nd Street, New York 17, N.Y., U.S.A. (*Mod. Plast.*)

Monthly Notices of the Royal Astronomical Society, Burlington House, London, W.1, England. (*Mon. Not. R. astr. Soc.*)

N

Nachrichten Technik, Verlag Technik, Berlin N.W.7, Unter den Linden 12, Germany. (*Nachr Tech.*)

Nature, Macmillan & Co. Ltd, St. Martin's Street, London, W.C.2, England. (*Nature, Lond.*)

Naturwissenschaften, Springer Verlag, Heidelberg, Neuenheimer Landstrasse 24, Germany. (*Naturwissenschaften*)

Nucleonics, 212 East York Street, York, Pa, U.S.A. (*Nucleonics*)

O

Observatory, Royal Observatory, Herstmonceux Castle, Hailsham, Sussex, England. (*Observatory*)

Onde électrique, 40 Rue de Seine, Paris 6e, France. (*Onde élect.*)

Optik, Wissenschaftliche Verlagsgesellschaft, Stuttgart 1, Postfach 40, Germany. (*Optik, Stuttgart*)

Österreichische Zeitschrift für Telegraphen- Telephon- Funk- und Fernsehtechnik, Springer Verlag, Wien I, Mölkerbastei 5, Austria. (*Öst. Z. Telegr. Teleph. Funk Fernsehtech.*)

P

Philips Research Reports, N.V. Philips Gloeilampenfabrieken, Eindhoven, Holland. (*Philips Res. Rep.*)

Philips Technical Review, (as for Philips Research Reports). (*Philips tech. Rev.*)

Philosophical Magazine, Taylor & Francis Ltd, Red Lion Court, Fleet Street, London, E.C.4, England. (*Phil. Mag.*)

Philosophical Transactions of the Royal Society, Cambridge University Press, Bentley House, London N.W.1, England. (*Phil. Trans.*)

Physica, Journal of the Dutch Physical Society. Martinus Nijhoff, Lange Voorhout 9, The Hague, Holland. (*Physica*)

Physical Review, 57 East 55th Street, New York 22, N.Y., U.S.A. (*Phys. Rev.*)

Post Office Electrical Engineers' Journal, Engineer-in-Chief's Office, Alder House, Aldersgate Street, London, E.C.1, England. (*P.O. elect. Engrs' J.*)

Poste e Telecomunicazioni, Ministero P.T., Viale Aventino 19, Roma, Italy. (*Poste e Telecomunicazioni*)

Proceedings of the Cambridge Philosophical Society, Cambridge University Press, Bentley House, London, N.W.1, England. (*Proc. Camb. phil. Soc.*)

Proceedings of the Institute of Radio Engineers, 1 East 79th Street, New York 21, N.Y., U.S.A. (*Proc. Inst. Radio Engrs*)

Proceedings of the Institution of Electrical Engineers, Parts I, II, III & IV, Savoy Place, London, W.C.2, England. (*Proc. Instn elect. Engrs*)

Proceedings of the Institution of Radio Engineers, Australia, Science House, Gloucester Street, Sydney, N.S.W., Australia. (*Proc. Instn Radio Engrs, Aust.*)

Proceedings of the National Electronics Conference, 852 East 83rd Street, Chicago 19, Illinois, U.S.A. (*Proc. nat. Electronics Conf., Chicago*)

Proceedings of the Physical Society, 1 Lowther Gardens, Prince Consort Road, London, S.W.7, England. (*Proc. phys. Soc.*)

Proceedings of the Radio Club of America, 11 West 42nd Street, New York, N.Y., U.S.A. (*Proc. Radio Cl. Amer.*)

Proceedings of the Royal Society, Cambridge University Press, Bentley House, London, N.W.1, England. (*Proc. roy. Soc.*)

Q

QST, American Radio Relay League Inc., 38 La Salle Road, West Hartford 7, Conn., U.S.A. (*QST*)

Quarterly of Applied Mathematics, Brown University, Providence 12, R.I., U.S.A. (*Quart. appl. Math.*)

Quarterly Journal of the Royal Meteorological Society, 49 Cromwell Road, London, S.W.7, England. (*Quart. J. R. met. Soc.*)

R

Radio Communication, 264 Main Street, Great Barrington, Mass., U.S.A. (*Radio Commun.*)

Radio française, 92 Rue Bonaparte, Paris 6e, France. (*Radio franç.*)

Radio professionnelle belge, Rue de Rivieren 96, Ganshoren, Brussels, Belgium. (*Radio prof. belge*)

Radio Technical Digest (Édition française), 122 Boulevard Murat, Paris 16e, France. (*Radio tech. Dig., Édn franç.*)

Radio Technik, Wien VI, Mariahilferstrasse 71, Austria. (*Radio Tech., Vienna*)

Radio & Television News, Ziff Davis Publishing Company, 64 East Lake Street, Chicago 1, Ill., U.S.A. (*Radio & Televis. News*)

RCA Review, RCA Laboratories Division, Princeton, N.J., U.S.A. (*RCA Rev.*)

Reports on Progress in Physics, The Physical Society, 1 Lowther Gardens, Prince Consort Road, London, S.W.7, England. (*Rep. Progr. Phys.*)

Research, Butterworth's Scientific Publications Ltd, 4–6 Bell Yard, Temple Bar, London, W.C.2, England. (*Research, Lond.*)

Review of Scientific Instruments, 57 East 55th Street, New York 22, N.Y., U.S.A. (*Rev. sci. Instrum.*)

Reviews of Modern Physics, 57 East 55th Street, New York 22, N.Y., U.S.A. (*Rev. mod. Phys.*)

Revista de Telecomunicación, Palacio de Comunicaciones, Madrid, Spain. (*Rev. Telecomunicación, Madrid*)

Revue générale de l'Électricité, 12 Place Henri Bergson, Paris 8e, France. (*Rev. gén. Élect.*)

Revue d'Optique, 3 & 5 Boulevard Pasteur, Paris 15e, France. (*Rev. d'Optique*)

Revue scientifique, 4 Rue Pomereu, Paris 16e, France. (*Rev. sci., Paris*)

Revue technique Compagnie française Thomson-Houston, 173 Boulevard Haussmann, Paris, France. (*Rev. tech. Comp. franç. Thomson-Houston*)

Ricerca scientifica, Roma, Piazzale delle Scienze 7, Italy. (*Ricerca sci.*)

R.S.G.B. Bulletin, New Ruskin House, Little Russell Street, London, W.C.1, England. (*R.S.G.B. Bull.*)

S

Schweizer Archiv für angewandte Wissenschaft und Technik, Buchdruckerei Vogt-Schild, Solothurn, Switzerland. (*Schweiz. Arch. angew. Wiss. Tech.*)

Science Reports of the Research Institutes Tohoku University, Series B,

Tohoku University, Sendai, Japan. (*Sci. Rep. Res. Inst. Tohoku Univ. Ser. B*)

Scientific Monthly, 10 McGovern Avenue, Lancaster, Pa. U.S.A. (*Sci. Mon.*)

Sylvania Technologist, Lawrence Street, Flushing, N.Y., U.S.A. (*Sylvania Technologist*)

T

Technical News Bulletin of the National Bureau of Standards, U.S. Government Printing Office, Washington 25, D.C., U.S.A. (*Tech. News Bull. nat. Bur. Stand.*)

Technique moderne, 92 Rue Bonaparte, Paris 6ᵉ, France. (*Tech. mod.*)

Technische Hausmitteilungen des Nordwestdeutschen Rundfunks, Verlag H.H. Nölke G.m.b.H., Hamburg 20, Hegestrasse 40, Germany. (*Tech. Hausmitt. NordwDtsch. Rdfunks*)

Technische Mitteilungen, Journal of the Swiss Post Office, Direction générale PTT, Berne, Speichergasse 6, Switzerland. (*Tech. Mitt. schweiz. Telegr.-TelephVerw.*)

Tele-Tech, 480 Lexington Avenue, New York 17, N.Y., U.S.A. (*Tele-Tech*)

Telefunken Zeitung, Telefunken G.m.b.H., Berlin S.W.61, Mehringdamm 32–34, Germany. (*Telefunken Ztg*)

Télévision, 9 Rue Jacob, Paris 6ᵉ, France. (*Télévision*)

Television Engineering. See Radio Communication.

Tijdschrift van het Nederlands Radiogenootschap, Oude Utrechtseweg 8, Baarn, Holland. (*Tijdschr. ned. Radiogenoot.*)

Toute la Radio, 9 Rue Jacob, Paris 6ᵉ, France. (*Toute la Radio*)

Transactions of the American Geophysical Union, National Academy of Sciences, Washington, D.C., U.S.A. (*Trans. Amer. geophys. Union*)

Transactions of the American Institute of Electrical Engineers, 33 West 39th Street, New York 18, N.Y., U.S.A. (*Trans. Amer. Inst. elect. Engrs*)

TSF et TV, 40 Rue de Seine, Paris 6ᵉ, France. (*TSF et TV*)

T.S.F. pour Tous. See TSF et TV.

V

Le Vide, Journal of the Société française des Ingénieurs Techniciens du Vide, 44 Rue de Rennes, Paris 6ᵉ, France. (*Le Vide*)

W

Weather, 49 Cromwell Road, London S.W.7, England. (*Weather*)

Wireless Engineer, Dorset House, Stamford Street, London S.E.1, England. (*Wireless Engr*)

Wireless World (as for Wireless Engineer). (*Wireless World*)

Z

Zeitschrift für angewandte Mathematik und Physik, Éditions Birkhäuser, Bâle, Switzerland. (*Z. angew. Math. Phys.*)

Zeitschrift für angewandte Physik, Springer Verlag, Heidelberg, Neuenheimer Landstrasse 24, Germany. (*Z. angew. Phys.*)

Zeitschrift für Meteorologie, Akademieverlag G.m.b.H., Berlin N.W.7, Schiffbauerdamm 19, Germany. (*Z. Met.*)

Zeitschrift für Naturforschung, Tubingen, Johannesweg 11, Germany. (*Z. Naturf.*)

Zeitschrift für Physik, Springer Verlag, Heidelberg, Neuenheimer Landstrasse 24, Germany. (*Z. Phys.*)

Zhurnal eksperimentalnoi y teoreticheskoi Fiziki, Academy of Sciences, Moscow, U.S.S.R. (*Zh. eksp. teor. Fiz.*)

Zhurnal tekhnicheskoi Fiziki, Academy of Sciences, Moscow, U.S.S.R. (*Zh. tekh. Fiz.*)

* * *

Section VIII—1953

Index to

Abstracts and References

This section contains an index, listed separately by author and by subject, for all Abstracts and References published in PROCEEDINGS OF THE IRE from February, 1953, through January, 1954.

AUTHOR INDEX

AUTHOR INDEX—A name followed by "and" is that of the first author of a jointly written paper, while the word "with" indicates that the name indexed is that of the second author.

A

Aaron, M. R., synthesis of feedback control systems, **3720**
Abadie, —, and — Blondé, Type-PM 53 broadcasting preamplifier, **3567**
van Abbe, H. H., efficiency and damping of diode rectifiers, **1195, 2129;** input impedance and transimpedance of i.f. transformers, **2578**
— and A. Boekhorst, frame-deflection circuit with voltage-dependent resistor, **3741**
— and J. Jager, application of Type-DK92 heptode at 30 Mc/s, **813**
— and others, new trends in a.m./f.m. receiver design, **2427**
Abbot, F. R., design of buried-conductor r.f. ground system, **(C)42**
Aberdam, H., u.h.f. dielectric aerials, **2896**
Abiko, Y., with M. Tomura, electron multiplication in hard flows of Se rectifiers, **2350**
Achard, É., theorem on ideal transformer networks, **1266**
Acheson, M. A., and E. M. McElwee, reliability of valves, **271**
Ackland-Snow, P. E., and G. A. Gledhill, 6-waveform generator and display unit for testing television channel, **1087**
Adam, E., calculation of transient phenomena in electrically short networks by means of Fourier integrals, **1926**
Adams, E., W. M. Hubbard and A. M. Syeles, permanent magnet from powdered MnBi, **1035**
Adelaar, H. H., cathode-follower operation, **(D)1285**
Admiraal, D., sawtooth derivator, **2269**
Adorian, P., television distribution by wire, **1808;** future of British broadcasting, **2445**
Affleck, J. H., with others, double activators in oxide-cathode base alloys, **3152**
Agdur, B. N., experimental observation of double-stream amplification, **3146**
— and C. G. L. Åsdal, noise measurements on travelling-wave valve, **3145**
Ahrendt, W. R., and J. F. Taplin, Automatic Feedback Control, **(B)840**
Aigrain, P., and H. Bulliard, photomagnetoelectric effect, theory of, **2015,** measurements of in Ge, **2016**
— and C. Dugas, physical properties and radio applications of semiconductors, **1703**
— J. Lagrenaudie and G. Liandrat, conductance of semiconductor in electric field, **1695**
Aisberg, É., miniature receivers for Palais de Chailiot translation service, **2794**
Akao, H., T. Takakura and T. Sasaki, dielectric constant of Rochelle salt at 3 kMc/s, **2729**
Akeley, E., with J. Swihart, axial motion of electrons in linear accelerator, **3077**
Akhiezer, A. L., and R. V. Polovin, plasma oscillations in crossed electric and magnetic fields, **3591**
Albagli, S., effect of losses in h.f. transmission lines, **3475**
Albers-Shoenberg, E., with D. R. Brown, ferrites speed digital computers, **2061**
Albright, W. G., with others, meteorological effects on v.h.f. propagation, **1784**
Alers, G. A., internal friction of quartz, **2349**
Alexander, A. E., with J. R. Anderson, theory of vibrating-capacitor converter, **475**
Alexanderson, E. F. W., control applications of transistor, **792**
Alison, W. B. W., and J. C. E. Taylor, direct-reading thermistor bridge, **(D)2740**
Alixant, M., applications of T networks, **1928**
Alkemade, C. T. J., and G. van den Brink, stabilized calibrated 50-c/s voltage source, **1424**
Allard, L. S., design factors of television c.r. tubes, **1540**
Alldredge, L. R., with T. B. Whiteley, photomechanical wave analyser for Fourier analysis of transient waveforms, **1439**
Allen, A. L., long-life d.c. contacts, **3497**
Allen, C. C., with H. R. Meahl, calibrating ammeters at frequencies > 100 Mc/s, **1075**
Allen, F., production of television receivers, **3739**
Allen, P. J., microwave magnetometer, **1072**
Allen, W. A., with P. H. Parkin, acoustic design of auditoria, **3175**
— with others, acoustics of Royal Festival Hall, **2198**
Allis, W. P., and S. C. Brown, h.f. breakdown of gases, **83**
Allison, C. T., and F. G. Blackler, univoltage e.s. lens for television c.r. tubes, **1541**
Allnatt, J. W., delay equalization of London/Birmingham television cable system, **1148**
Alma, G. A., G. Diemer and H. Groendijk, rubber-membrane model for electron paths, **3756**
Almond, M., J. G. Davies and A. C. B. Lovell, velocity distribution of sporadic meteors, **1009**
— with G. S. Hawkins, radar observations of major night-time meteor streams, **108**
Alon, I., J. Arsac and J. L. Steinberg, distribution of radio brightness on solar disk at 9·35 kMc/s, **3272**
Alpert, D., production and measurement of ultra-high vacuum, **3603**
Alsberg, D. A., principles and applications of converters for h.f. measurements, **155;** sweep-frequency response of RG-6U cable, **(D)3058**
Altenburg, K., and S. Kastner, demodulation of ultrasonic waves in liquids, **2864**
Althans, W., radio technology and electroacoustics at 1952 Technical Fair, Hanover, **299**
Altrichter, E., interference evaluation by means of noise filters, **2430**
Amakasu, K., noise due to current flow through Ba-Sr oxide coating, **1532**
Ament, W. S., theory of reflection by rough surface, **1106**
An Wang. See Wang, An.
Anders, T., diffraction of acoustic waves at circular aperture, **3170**
Anderson, A. E., transistors in switching circuits, **652**
Anderson, D. V., and C. Barnes, dispersion of ultrasonic pulse transmitted through tube filled with water, **2538**
Anderson, F. B., gain and phase-angle measuring set, **(A)2738**
Anderson, H. L., and others, synchrocyclotron for 450-MeV protons, **1764**
Anderson, J. M., with J. A. Bronzo, plastic lenses for high-intensity ultrasonic radiation, **915**
— with others, interaction of microwaves in gas-discharge plasma, **2637, 2970**
Anderson, J. R., digital computers, ferroelectric storage elements for, **1053, 3049,** electrical delay lines for, **3650**
— and A. E. Alexander, theory of vibrating-capacitor converter, **475**
Anderson, J. S., and N. N. Greenwood, semiconducting properties of Cu_2O, **1701**
Anderson, L. J., sensitivity of microphones to stray magnetic fields, **1897**
— and E. E. Gossard, field-strength prediction for nocturnal duct, **1112**
Anderson, N. S., longitudinal magneto-hydrodynamic waves, **2635**
Anderson, P. A., comparison of methods of contact-potential measurement, **993**
Anderson, R., and J. R. Smith, delayed-trigger oscillograph for television waveforms, **1438**
Anderson, R. S., W. V. Smith and W. Gordy, line breadths of the microwave spectrum of O_2, **91**
Anderson, T. N., high-power microwave dummy loads, **2892**
Anderson, V. C., and P. Rudnick, thermistor-bridge correlator, **3350**
Anderson, W. G., and E. H. Fritze, instrument-approach-system steering computer, **1369**
Anderson, W. N., with A. R. A. Rendall, temporary links for television outside broadcasting, **1143**
André, P., physical properties of araldite, **138**
Andreasen, M., with H. L. Knudsen, theory of plane reflectors in aerial systems, **1813**
Andrejewski, W., diffraction of e.m. waves at conducting circular disk and at circular aperture, **3270**
Andrew, A. M., corona discharge tubes for voltage stabilization, **(D)2803**
Andris, P., with R. E. Beam, input impedance of folded-dipole aerials, **3438**
Angelov, B. P., E. M. Lobanov and S. V. Starodubtsev, action of electron stream on current sensitivity of Se and Ag_2S photocells, **3140**
Angles d'Auriac, H., analysis of signals and of linear transmission operators, **3703**
Anliker, M., W. Känzig and M. Peter, properties of very small ferroelectric particles, **3007**
Antoine, R., with F. P. Pietermaat, h.f. tempering of band-saw teeth, **179**
Aono, Y., world-wide distributions of f_oF_2, **2984**
— with others, graphical calculation of h.f. sky-wave field strength, **2777**
Apker, L., and E. A. Taft, photoconduction in anodic Ta_2O_5, **783;** field emission from photoconductors, **1391**
— E. Taft and J. Dickey, electron scattering and photoemission from Cs_3Sb, **1690**
— with E. Taft, photoemission from Cs_2Te and Rb_2Te, **1689**
Applebaum, S., gamma correction in constant-luminance colour-television systems, **238**
Appleton, E. V., 'sluggishness' of ionosphere, **3289;** storm phenomena in ionosphere, **3304**
— and W. J. G. Beynon, radiocommunication on frequencies exceeding predicted m.u.f. values, **3090**
— and W. R. Piggott, ionospheric storms and geomagnetic anomalyi n F_2 layer, **2308**
Arata, H., with others, dissociation of oxide-coated cathode, **2834**
Archbold, R. B., probe microphone for measurement of sound pressure, **1585**
Arendt, P. R., adaptation of eye in relation to television transmission, **568**
Arens, W., with H. Holzwarth, modulation equipment for 24-channel p.p.m. beam R/T system, **822**
Arfin, B., with G. A. Espersen, 3-cm magnetron for beacons, **2186**
Argence, É., and M. Mayot, calculation of true heights of ionospheric layers, taking account of geomagnetic field, **3290**
— K. Rawer and K. Suchy, effect of geomagnetic field on ionospheric absorption of short waves, **1678**
Argirovic M., method of determining conductivity of heterogeneous ground, **3687**
Arima, Y., with H. Uyeda, classification of F_2-layer storms, **2893**
Arizumi, T., and S. Kotani, gettering process of Ba, **2321**
Armitage, M. D., improved stabilization with voltage-regulator tube, **837**
Armstrong, H. L., proof of formula for power of a matrix, **2253;** saturated-diode operation, **(D)2512;** two *RC* oscillator circuits, **2935**
— with J. H. Simpson, reverse characteristics of Ge rectifiers, **1715**
Armstrong, L. D., production of *p-n* junctions by diffusion of impurity through metal layer, **739**
— with others, Ge *p-n-p*-junction transistor, **876**
Armstrong, W. J., with others, axial-flow u.h.f. resnatron, **1208**
Arnaud, J. P., choice of television channels and standards in S. America, **1494**
Arnold, A. H. M., a.c. resistance standards, **3360**
Aron, A., Maze counters, **3089**
Arsac, J., with others, distribution of radio brightness on solar disk at 9·35 kMc/s, **3272**
Arsove, M. G., algebraic theory of linear transmission networks, **3229**
Arthur, G. R., narrow-band noise after nonlinear device, **816;** servomechanisms, a survey, **830**
von Arx, E. F., with others, servomechanism transient performance from db/log *f* plots, **3721**
Arzeliès, H., mean velocity of energy in stratified ionized absorbing medium, **196;** differential equation for e.m. rays in ionized absorbing medium with slowly varying parameters, **1465**
Ascoli, R., coupling of 'scale-of-two' circuits, **950;** theory of compensated delay line, **1262**
Åsdal, C. G. L., with B. N. Agdur, noise measurements on travelling-wave valve, **3145**
Ashcroft, H., W. W. H. Clarke and J. D. S. Hinchliffe, factors affecting performance of coaxial cables for television links, **928**
Ashdown, G., vapotron transmitting valves, **3451**
Ashmead, D., optimum design of linear arrays, **1594**
Ashour, A. A., induction of currents in a disk by sudden creation of magnetic poles, **708**
Ashwell, G. E., with others, measurement of phase velocity of 127·5-kc/s ground wave, **1782**
Aslakson, C. I., new determinations of velocity of radio waves, **1470**
Aspden, H., magnetic permeability measurement for rod specimens, **1429**
Assadourian, F., distortion of f.m. signal by small loss and phase variations, **1484**
— and E. Rimai, theory of microstrip transmission lines, **682, 2213**
Astuni, E., power in *LRC* circuits with nonsinusoidal voltage, **1259;** Heaviside's condition for distortionless transmission, **2560**
Ataman, A., artificial-slot aerials, **1916**
Atkins, A. A., applications of electronics in textile industry, **504**
Atkins, H. J. B., with G. C. Newton, application of television to demonstration of surgery, **1845**
Atkins, I., engineering technique of television programme production, **843**
Atkinson, A. B., with others, factors affecting design of mass-production television receivers, **1496**
Atkinson, P. D., optimum input-winding resistance of magnetic amplifier with voltage feedback, **3210**
Atlas, D., M. Kerker and W. Hitschfeld, scattering and attenuation by nonspherical atmospheric particles, **2314**
Atterling, H., and G. Lindström, 225-cm cyclotron at Stockholm, **506**
Attew, J. E., television-waveform monitor, **1736**
Attree, V. H., feedback-pair video amplifier, **366;** saturated-diode operation of miniature valves, **1197, (D)2512;** measurements of saturated-diode stability, **2511;** differential input stage for a.f. amplifiers, **2816**
Attura, G. M., effects of carrier shifts on derivative networks for a.c. servomechanisms, **2452;** magnetic amplifier with reset control, **2581**
Auerbach, I. L., with J. O. Paivinen, design of triode flip-flops for long-term stability, **3558**
Augustin, E., 1952 u.s.w. conference, Stockholm, **1488**
Auld, J. S., U.S. Army Signal Corps mobile television system, **1821**
Aumont, R., and J. Romand, precision measurement of direct voltages by comparison, **2726**
— with others, variation of resistance of thin metal films as function of applied potential, **3339**
d'Auriac, H. Angles. See Angles d'Auriac, H.
Avazashvili, D. Z., diffraction of e.m. waves, **1972**
Avery, D. G., optical constants of PbS, PbSe and PbTe in 0·5–3μ wavelength range, **2018**
— and P. L. Clegg, optical constants of single-crystal Ge, **3344**
Awender, H., and K. Sann, activity measurement for quartz crystals in parallel-resonance circuits, **1273**
Axelby, G. S., with others, synthesis of paralleled 3-terminal *RC* networks, **3536**
Axon, P. E., and W. K. E. Geddes, calibration of disk recordings by light-pattern measurements, **2875**
— with E. D. Daniel, reproduction of signals recorded on magnetic tape, **2554**
Axworthy, F. B., and J. K. Choudhury, design and application of portable e.s. wattmeter, **1081**

B

Babcock, W. C., intermodulation interference in radio systems, **1796**
Babin, F., mutual impedance of two thin straight aerials, **2569**
Bache, H., and F. A. Benson, peak-noise characteristics of voltage-regulator tubes, **2516**
Bachman, C. H., G. L. Hall and P. A. Silberg, positive and negative ions in c.r. tubes, **2846**
Bachman, J. F., moving-target indication in pulse radar systems, **2672**
Bacon, G. E., R. Street and R. H. Tredgold, antiferromagnetic properties of CoO-MnO mixtures, **2343**
Bacon, W., and D. P. Salmon, *RC* circuits with voltage gain, **663**
Badoyannis, G. M., with others, ratio meter measures reflection coefficient, **466**
Bady, I., techniques in measurement of various components, **457**
Baerwald, H. G., and D. A. Berlincourt, electromechanical response and dielectric loss of prepolarized $BaTiO_3$ ceramic, **3168**
von Baeyer, H. J., and R. Knechtli, analysis of multiconductor systems with h.f. TEM waves, **26**
Bähring, H., timebase circuits, **1631**
Bailey, R., control of thyratrons by small signals, **3218**
Bailin, L. L., and M. J. Ehrlich, factors affecting performance of linear arrays, **1241**
— with H. F. O'Neill, effects of dimensional errors on performance of linear shunt-slot arrays, **1592**
Bathias, E., C. Hagen and H. H. Rust, variation of partial processes in magnetostriction, **130**
— with H. H. Rust, ultrasonic-wave generators using dumb-bell type magnetostrictive oscillators, **1556**
Bain, W. C., propagation of 16-kc/s waves reflected obliquely from ionosphere during solar flare, **2769**
Bainbridge-Bell, L. H., arrangement of circuit diagrams, **3492**
Baker, R. H., and others, phase-bistable transistor circuit, **3515**
Baker, W. G., and D. F. Martyn, conductivity of ionosphere, **1352**
Baker, W. R. G., revised specifications for field tests of N.T.S.C. colour television, **2466**
Bakhrakh, L. E., theory of multisegment magnetron, **3158**
Balaam, N. B., G-M counter tubes, **797**
Balmer, J. R., with R. J. Heritage, metallizing glass, ceramic and plastic surfaces, **2346**
Banerjee, S. M., and R. Roy, high-precision ionosphere-sounding equipment, **1677**
Banerji, R. B., studies on random fading characteristics, **2120**
Bangen, G., and H. W. Fastert, fundamentals of probability theory, **197**
Banks, E., with others, rare-earth titanates with perovskite structure, **1717**
Bannon, J. K., R. Frith and H. C. Shellard, humidity of upper troposphere and lower stratosphere over southern England, **1671**
Baños, A., Jr, and R. K. Golden, e.m. field of rotating magnetized sphere, **1334**
Baral, S. S., and A. K. Saha, observations at Calcutta of pulses transmitted from Delhi, **2116**
Barbera, R. C., with W. C. Michels, frequency-eliminating transconductance bridge, **59**
Barbier, M., calculation of third-order aberrations of centred electron-optical systems, **3083**
Barchewitz, P., with F. Cassanas, automatic tracer for electron trajectories, **476**
Bardeen, J., with W. H. Brattain, surface properties of Ge, **1698**
Barden, S. E., electron synchrotron, **182**
Bardócz, Á., and Á. Kemény, electronic spark-timing device, **455**
Bardsley, W., with J. W. Granville, properties of Si point-contact transistors, **2822**
Barducci, I., artificial ears for calibrating telephone receivers, **1888**
Bargain, —, radio installations at French overseas aerodromes, **3419**
Barkechli, M., measurement of intervals of musical scale, **1887**
Barker, R. H., pulse transfer function and application to sampling servo systems, **1131**
Barkla, H. M., and D. M. Finlayson, properties of KH_2PO_4 below Curie point, **2047**
Barkow, P., transmission performance figures for directional p.p.m. systems, **2146**
Barlow, H. M., power-carrying capacity of h.f. waveguides, **(D)27;** input impedance characteristics of antiresonant h.f. transmission lines, **(D)318**
— and H. G. Effemey, multichannel switch for microwave circuits, **1252**
— and A. E. Karbowiak, cylindrical surface-wave resonator for determination of velocity of short e.m. waves, **3355**
Barnes, C., with D. V. Anderson, dispersion of ultrasonic pulse transmitted through tube filled with water, **2538**
Barnes, G., with others, field emitter, **3062**
Barnett, S. J., determination of magnetic moment, susceptibility and permeability, **472**
— and L. A. Giamboni, new gyromagnetic effect in permalloy and iron, **757**
— with S. Brown, carriers of electricity in metals with positive Hall effects, **700**
Barney, J. M., with A. W. Sullivan, nonlinear statistical filter, **667**
Barnhart, P. W., with others, improved magnetic servo amplifier, **(A)3794**
Barone, A., concentration of ultrasonic energy, **603**
Barreis, B., and M. Munsch, 'conductron' photoconductive camera tube, **3128**
Bartels, G., highly stable receiver for space waves, **2123**
— with E. A. Lauter, optical refraction and u.s.w. propagation in Baltic area, **521**
Bartels, J., and P. ten Bruggencate, Landolt-Börnstein Zahlenwerte und Funktionen aus Physik, Chemie, Astronomie, Geophysik und Technik: Vol. 3—Astronomie und Geophysik, **(B)1359**
— and J. Veldkamp, international data on magnetic disturbances, first quarter 1952, **461,** second quarter 1952, **1340,** third quarter 1952, **1989,** fourth quarter 1952, **3285**
Barthélemy, R., French origin of image-orthicon target, **2808**
Bartlett, S. C., public-address systems for power stations, **615, 3470**
— with others, radio interference tests in field and laboratory, **2431**
Bartley, W. P., and J. E. White, alterations of characteristics of oxide-cathode valves, **3755**
Barton-Chapple, H. J., sound and television signal distribution at South Bank, **23**
Baruch, J. J., shaping of characteristics of nonlinear resistors, **341**
— and H. C. Lang, analogue computer for use in loudspeaker design, **3050**
Bashara, N. M., fluorinated liquid dielectrics, **(A)3037**
Bassett, H. G., and J. R. Tillman, transient effects in point-contact transistors, **2491**
Batchelder, L., optimum signal characteristics for distance measurement by echoes, **411**
Bates, D. R., reactions in the upper atmosphere, **1342**
— and G. Griffing, scale-height determinations and aurorae, **3309**
Bates, L. F., post-war developments in magnetism, **87**
Bath, F., and W.v. Werther, carrier-frequency cable links, **2436**
Bauch, F. W. O., new capacitor microphones, **1230**
Bauer, B. B., wear of gramophone needles, **(A)316;** acoustic damping for loudspeakers, **3179**
Bauer, J., terminal equipment for carrier-current telephony systems, **1121**
Baum, R. M., and C. S. Hung, activation energy of heat-treatment-induced lattice defects in Ge, **742**
Baum, R. V., with C. D. Morrill, diode limiters simulate mechanical phenomena, **448;** stabilized electronic multiplier, **3643**
Baumann, E., Fischer large-screen projection system, **2473**
Baumgartner, W., and N. Schaetti, infrared sensitive electron-multiplier photocell, **1520**
— with N. Schaetti, dark current of electron-multiplier photocells, **1518, 2492**
Baxandall, P. J., negative-feedback tone control, **64**
— with S. W. Noble, design of d.c. amplifier based on second-harmonic type of magnetic modulator, **72**
Bayard, M., synthesis of *n* terminal-pair networks, **1617**
Bayet, M., e.m. properties of plasmas, **1659**
— and G. Dumas, operation of Penning gauge, **2634**
Bayford, L. J., modern television c.r. tube manufacture, **1870**
Bayliss, A. J., 10-channel pulse-code telemetry system, **488**
Beam, R. E., and P. Andris, input impedance of folded-dipole aerials, **3438**
— and D. A. Dobson, duo-dielectric coaxial waveguide, **2885**
— and H. M. Wachowski, shielded dielectric rod waveguides, **2218**
Bean, B. R., distribution of refractive-index gradient, **1961**
Beard, C. I., and E. N. Skomal, *RC* commutator for signal/noise improvement, **2784**
Beard, D. M., and A. M. Erickson, auditorium designed for technical meetings, **610**

Beard, E. G., loop aerials for portable broadcast receivers, 3481
Beard, M., and T. Pearcey, electronic computer, 1050
Beattie, J. R., and G. K. T. Conn, simple 1–3-c/s oscillator, 2950
Beatty, R. W., and A. C. Macpherson, mismatch errors in microwave power measurements, 3661
—— with F. Reggia, u.h.f. magnetic attenuator, 964
Beauchamp, K. G., blocking oscillators, 2606
Beaujard, L., elimination of parasitic echoes in ultrasonic flaw detection, 492
Beaumariage, D. C., with others, transient response of magnetic amplifiers, 2238
Beaumont, F. H., comparator a.m./f.m. receiver, 2121
Bechert, K., theory of nonlinear electrodynamics, 1969
Bechmann, R., thickness vibrations of piezoelectric crystals, 357, 3553; quartz and synthetic-crystal piezoelectric resonators, 1376
Beck, A. C., with S. E. Miller, low-loss waveguide transmission, 1585
Beck, A. H., and A. D. Brisbane, cylindrical magnetron ionization gauge, 3000
—— and A. B. Cutting, reflex klystrons for cm-wave links, 1546
Becker, G., G. Bobbert and H. Brandt, measurements of acoustic properties of building materials, 311
Becker, R., design and performance of medium-wave directive aerial system, 2227
Becker, W. M., and K. Lark-Horovitz, semiconducting Ge films, 3615
Beckmann, B., ionosphere conditions and radio 'weather', 2417
Beckwith, R. W., frequency-shift carrier-current equipment for telemetry and control, 1482
Beddoes, M. P., impedance-measuring apparatus, 1432
Bedford, L. H., effect of tube characteristics and other factors on television camera design, 854
Behling, H., all-wave receiver Type E103AW/4, 207; input circuit and i.f. amplifier of p.p.m. 24-channel equipment, 1483
—— G. Brühl and E. Willwacher, dm-wave beam radio equipment FREDA I, 2160
Behr, A., with H. Siedentopf, ionosphere disturbance of 23rd–28th Feb. 1952, 101
Behrend, P., theory of pulse technique for coaxial cables, 1905
Behrent, L. F., r.f.-micropotentiometer resistance elements, 3525
Behrmann, H., reed-type frequency meter for 5–270 c/s, 1079
Bekefi, G., diffraction of e.m. waves by aperture, 1293
Belevitch, V., results and problems of network synthesis, 1616
Beiger, E., measurement and assessment of noise interference, 3406
Bell, D. A., current noise in semiconductors, 747, 748; 'ideal coding' *v.* 'redundancy', 1478; Wiener's theory of linear filtering, 2260; value of forecasts, (D)2767; Information Theory and its Engineering Applications, (B)2795; correlation *v.* linear transforms, (D)3701; economy of bandwidth in television, 3731
—— and H. O. Berktay, cathode follower as high-impedance input stage, 367
—— J. C. Cluley and H. O. Berktay, measurement of cathode temperature of diodes, 1199
Bell, D. G., and others, electronic band structure of PbS, 2037
Bell, J., J. A. B. Davidson and E. T. A. Phillips, recent developments in phototelegraphy and facsimile transmission, 557
Bell, J. S., new focusing principle for proton linear accelerator, 1766
Belove, C., tolerance coefficients for *RC* networks, 3224
Belyaev, I. N., and A. L. Khodakov, dielectric properties of $PbTiO_3$ single crystals, 1410
—— and others, dielectric properties of $BaTiO_3$ single crystals, 3009
Bemporad, M., with R. Gans, theory of straight aerial, 2220
Bender, R. S., with others, r.f. power supply, 1134
Bene, G. J., determination of nuclear moments from microwave spectra, 1008
Benedict, T. S., and W. Shockley, microwave determination of collision frequency of electrons in Ge, 2330
Beneking, H., investigations on dynamic secondary-electron multipliers, 289
—— with J. Malsch, transistor properties and circuits, 44
Beneson, L. S., calculation of excitation of waveguides, 2563
Bengtson, L., with others, integrating amplifier for c.r.o. recording of magnetic flux, 3062
Benham, W. E., extension of planar-diode transit-time solution, (D)1862
de Bennetot, M., experimental investigation of oscillation mode of reflex klystron, 3159
Bennett, G. S., method for investigating ultrasonic fields, 8
Bennett, W. P., and H. F. Kazanowski, 1-kW tetrode for u.h.f. transmitters, 1206
Bennington, T. W., ionosphere review for 1952, 1016; critical-frequency variations in northern and southern hemispheres, 2657
—— and L. J. Prechner, B.B.C. ionospheric-storm-warning system, 103
Benson, F. A., characteristics of glow-discharge voltage-regulator tubes, (D)267, 591; waveguide attenuation and surface roughness, 1584, 2881; accuracy of c.r.o. methods of phase-angle measurement, 1740; voltage stabilization, 2458; characteristics of large-current glow-discharge tubes, 3457
—— and M. S. Seaman, phase-angle measurements with c.r.o., 1739
—— and J. P. Smith, characteristics of corona stabilizer tubes, 3155
—— with H. Bache, peak-noise characteristics of voltage-regulator tubes, 2516
—— with R. M. Pearson, direct-reading thermistor bridge, 1749, (D)2740, (D)3386
Benson, T. E., methods and colorimetric principles of colour television, 1313
Benz, F., new modulation method with reduced bandwidth, 3415
van den Berg, G. J., with others, influence of magnetic field on resistance of Fe films, 1039
Berger, M., dimensions and units, 86
Bergmann, W. H., discharges in magnetic fields, 1653
Bergstralh, T. A., and others, portable 250-kV accelerator, 3679
van Berkel, P. L. M., Netherlands P.T.T. ionosphere-sounding equipment, 2989
Berkowitz, A. E., with A. D. Franklin, approach to saturation in dilute ferromagnetic materials, 2337
Berkowitz, R. S., optimum linear shaping and filtering networks, 2136; networks with input impedance or transfer admittance of constant magnitude or phase, 2251
Berktay, H. O., noise in interface resistance, 1530
—— with D. A. Bell, cathode follower as high-impedance input stage, 367
—— with others, measurement of cathode temperature of diodes, 1199
Berlin, H., and G. L. Werner, medium-cost amplifier with good performance, 979
Berlincourt, D. A., and F. Kulcsar, electromechanical properties of $BaTiO_3$ compositions, 1042
—— with H. G. Baerwald, electromechanical response and dielectric loss of prepolarized $BaTiO_3$ ceramic, 3168
Bernard, M., spherical aberration of grid-type electron lenses, 1101
—— with J. Cordonnier, broadcasting-studio installations and new S.F.R. equipment, 326
Bernard, M. Y., e.s. lenses, for focusing very-high-energy particles, 1769, for focusing high-energy particles, 2409; motion of ions in linear accelerators, 2755, 3079; focusing of high-energy particles by grid lenses, 3387
Bernard, P., eleven-year variation of earth's magnetic field, 1337
Bernardi, L., multichannel radio link between Mestre and Trieste, 3109
Berndt, W., combined transmitting aerials for television and u.s.w. broadcasting, 37
Bernstein, M., with A. C. Pritchard, impedance meters for crystal units, 2390
Bero, O., technical arrangements in Cologne broadcasting centre, 3716
Berry, F. J., diffraction of sound pulses, by oscillatory long strip, 601, by nonrigid semi-infinite plane screen, 602
Berry, S. D., new equipment for outside broadcasts, 224
Bertein, F., calculation of trajectories in electron optics, 511; analogy between electron lenses and electrical quadripoles, 2760; aberrations of electronic images of irregular emissive cathodes, 3081; representation of optical and electron lenses by resistive quadripoles, 3084
Berth-Jones, E. W., significance and measurement of intermodulation distortion, 1737
Berthold, R., and A. Trost, G-M counter arrangement for X-ray interference measurements, 799
Besthorn, W., mains-loading calculation for quenched-spark h.f. generators, 361
Bethge, H., construction details of e.s. electron microscope, 2101
Bevan, P. A. T., B.B.C. television broadcasting stations, 1171; 100-kW television station, Sutton Coldfield, 1508
Beyer, R. T., acoustics bibliography, 1, 910, 1549
Beynon, W. J. G., with E. V. Appleton, radiocommunication on frequencies exceeding predicted m.u.f. values, 3090
Bhargava, B. N., new early-morning ionospheric phenomenon, 1345
Bhattacharyya, B. K., admittance and transfer function of *n*-mesh *RC* filter network, 1934; reproduction of flat top of pulse in amplifier, 3566
—— with S. K. Sen, triggering of plate-coupled multivibrator by negative pulses, 3557
Bibl, K., dynamic phenomena in ionosphere, 404; ionization of the E layer, 721; new ionosphere sounder, 724
Bick, J. D., methods of measuring suface induction of magnetic tape, 2552
Bickford, L. R., Jr, with others, lattice constants and dielectric properties of $BaTiO_3$-$BaSnO_3$-$SrTiO_3$ ceramics, 1718
Bierl, R., frequency analysis of acoustic phenomena, 1886; relations between electrical and mechanical production of musical sounds, 3461
Biermann, L., origin of magnetic fields in moving plasma, 1985
—— and H. Billing, modern mathematical machines, 1723
Bies, F. R., attenuation equalizers, 2594
Biggar, H. P., transfer matrix of passive quadripole, 1604
Biggs, A. J., and E. O. Holland, British television receiver, 1495
—— and R. A. Mills, performance of television receiver installations in presence of interference, 1511
Biguenet, C., and M. Vassilian, gas-filled valves for industrial applications, 295
Billig, E., physics of transistors, 285; effect of minority carriers on breakdown of point-contact rectifiers, 437
—— and J. J. Dowd, *p-n* junction revealed by electrolytic etching, 3332
Billing, H., magnetostatic store for computers, 1724
—— with L. Biermann, modern mathematical machines, 1723
Billinghurst, F. M., with others, automatic-scanning receiver for radio monitoring, 2122
Billottet, H., with P. M. Prache, magnetodynamics of ferrites, 1029
Bingley, F. J., colorimetry in colour television, 3123
Biosca, L. F., with W. Clarkin, valve sockets for industrial equipment, 1860
Bird, A. G., and W. S. McGuire, radio bearer equipment for carrier telephone systems, 3412
Bird, R., computing machines, 3644
Birdsall, C. K., and J. R. Whinnery, waves in an electron stream, 2498
—— G. R. Brewer and A. V. Haeff, resistive-wall amplifier valve, 3147
Birkinshaw, D. C., engineering technique of television programme origination, 842
Bischoff, A. F., quality factor for radar c.r.-tube displays, 2317
Bishop, F. W., objective-aperture centering device for electron microscope, 2758
Bishop, N., noise limiter for mobile v.h.f. receivers, 2780
Bixler, O. C., binaural recording system, 1902
Bizette, H., R. Chevallier and B. Tsaï, thermomagnetic properties of haematite, 2705
Bjornson, G. A., graphical network synthesis for a.c. servomechanisms, 2448
Blachman, N. M., information capacities of a.m. and ph.m. systems, 2786; output signal/noise ratio of power-law device, 3405
Blackett, P. M. S., negative experiment on magnetism and earth's rotation, 1333
Blackler, F. G., with C. T. Allison, univoltage e.s. lens for television c.r. tubes, 1541
van Bladel, J., and T. J. Higgins, electromagnetic propagation in layered-dielectric waveguides, 321
Blaha, A., VVB-RFT receivers at the Leipzig Fair, 810
Blair, J. C., J. N. Brown and J. M. Watts, ionosphere recorder for 50 kc/s to 1 Mc/s, 1998
Blake, L. V., number of pulses per beam width for radar, 2671
Blake, R. F., pulse-group coding and decoding by passive networks, 2441
Blanc, D., G-M counters, self-quenching, functioning of, 3086, with external cathode and pure methyl-alcohol filling, 3087
—— and H. Zyngier, application of Wilkinson's theory to G-M counters with external cathode, 3389
Blanc-Lapierre, A., and N. Nifontoff, properties of potential barriers, 2629
Blank, K., with others, thermally produced lattice defects in Ge, 1697
Blankenburg, G., and O. Böttger, dependence of low-temperature conductivity of Cu_2O on oxygen pressure, 1387
—— and K. Kassel, semiconductor properties of Cu_2O in relation to production methods, 1383
—— C. Fritzsche and G. Schubart, dependence of low-temperature conductivity of Cu_2O on oxygen pressure, 1385
Blaquière, A., nonlinear oscillator, perturbed by noise, power spectrum of, 968, 2934, and Nyquist diagram, 1625, 2232; effect of background noise on valve oscillators, 1945
Bleazey, J. C., with others, uniaxial microphone, 2199
Blecher, F., with H. A. Finke, wide-band frequency-sweep generator for testing television equipment, 486
Blet, G., laws governing characteristics of photocells, 3141
Bleuze, J., and P. Dussaussoy, sealing by optical polishing, 141
Blewett, J. P., radial focusing in linear accelerator, 1455
—— with others, origin of 'strong-focusing' principle, 3678
Bliss, J. L., with T. Worswick, television camera with optical view-finder, 856
Bloch, A., measurement of nonlinear distortion, 2734
—— F. J. Fisher and G. J. Hunt, equipment for impedance matching and measurement at v.h.f., 1747
Blodgett, H. C., with others, masking of tones by noise as function of interaural phase, 9
Blondé, —, with — Abadie, Type-PM53 broadcasting pre-amplifier, 3567
Bloom, L. E., with W. W. Cannon, analysis of modulated electron beam, [illegible]
Blow, W., maritime distress frequency, 829
Blum, E. J., asymmetry of dm-λ radiation from sun, 3273
—— with others, radio observations of eclipses on 1st Sept. 1951 and 25th Feb. 1952, 94
Blunden, W. R., with D. M. Myers, C.S.I.R.O. differential analyser, 1049
Boadle, R. D., multichannel microwave relay system, 3110
Boast, W. B., electronic wattmeter, 3669
Bobbert, G., with others, measurements of acoustic properties of building materials, 311
Bobenrieth, A., degassable Penning gauge, 3001
Bock, H., with D. Hopf, circuit technique of new valves for a.m./f.m. receivers, 204
Bödeker, H., with F. Kirschstein, modulation distortion in television reception, 260
Boden, E. H., factors affecting design of v.h.f.-u.h.f. tuners, 3138
Bodle, R. R., Cheltenham 3-hour-range *K*-indices, April–June 1952, 397, July–Sept. 1952, 1336, Oct.–Dec. 1952, 1987, Jan.–March 1953, 3280
Boe, R. C., with K. C. Mathews, application of nonlinear techniques in servomechanisms, 3111
Boekhorst, A., intercarrier-sound television receivers, 857, 3734
—— P. D. van der Knaap and P. A. Neeteson, ECL80 and EQ80 valves in flywheel synchronizing circuits, 2168
Boekhorst, A., with H. H. van Abbe, frame-deflection circuit with voltage-dependent resistor, 3741
Boella, M., television study centre, 3120
Boers, C. J., and A. G. W. Uitjens, line-timebase output stages with booster circuit, 2478
Boersch, H., energy distribution of thermoelectrons in electron-beam devices, 2363
Bogle, A. G., microwave fading on 30-mile optical path over sea, 203
Bohn, L., with E. Meyer, sound reflection at surfaces with periodic structure, 1895
Bonnenstengel, H., rhombic aerial for reception, 2223; reception of frequency-shift signals from s.w. transmitters, 3399
Boljahn, H., with P. Wenk, ultrasonic tinning of Al, 801
Bolle, A., and P. Dominici, calculation of ionospheric absorption of short waves, 1351
Bolle, A. P., equivalent *Q* of *RC* networks, (D)3221
Bonifas, H., relation between sparking phenomena and cathode e.s. field, 292; Schottky's equation for thermal electron emission, 1861; new representation of dielectric losses in solid insulating material, 2354
Bonnel, H., with H. Figour, quality estimation for powdered Zr getter material, 3034
Bonnell, C. R., torque type of analogue computer, 2364
Bonner, W. F., and F. J. Oliver, developments in metal rectifiers, 2154
Bonnet, —, accurate frequency meters for range 22–37 kMc/s, 3668
Bonpas, M., with R. Meunier, enamel seal for thin mica windows, 3638
Booth, A. D., digital computer, physical realization of, 447, design of magnetic heads for, 768, logical symbols for circuit elements of, 1052
Borchardt, R. L., citizens'-radio class-A equipment, 2437
Bordewijk, J. L., intermodulation noise in multichannel telephony systems, 827
Boré, G., and W. Rappaport, 'fixed level' recording method for propagation research, 2065
Borgars, S. J., development of vacuum capacitors, 52
Borgnis, F. E., acoustic pressure of plane waves at oblique incidence, 6; physics of sound radiation pressure, 1878; forces due to acoustic wave in viscous medium, 2536
v. Borries, B., F. Lenz and G. Opfer, remanence in soft-iron circuits of magnetic electron lenses, 2102
Borst, J. M., with others, experiments on synthetic speech sounds, 919
Boscher, J., numerical determination of biharmonic functions by means of resistor network, 1727
Bose, H. N., and J. Sharma, decay of long-period afterglow of alkali halides, 2680
Bösenberg, W., and E. Fues, barrier layer of Ge plate rectifier with forward current, 2698
Bosse, G., calculating filter circuits with flattened attenuation curves, 962
Bosse, H., u.s.w. wide-band directive aerial, 636; slotted-cylinder aerials, 2223
Bostick, W. H., and M. A. Levine, demonstration of magneto-hydrodynamic waves in ionized He, 89
Botden, T. P. J., transfer of energy by resonance processes in luminescent solids, 372
Both, E., magnetic-powder cores for military communication equipment, [illegible]
Botsford, J. H., R. N. Lane and R. B. Watson, reverberation chamber with polycylindrical walls, 922
Böttger, O., conductivity measurements on Cu_2O at high temperatures, 1386
—— with G. Blankenburg, dependence of low-temperature conductivity of Cu_2O on oxygen pressure, 1387
Bouchard, J., ionospheric propagation of decametre waves in arctic polar regions, 1783
Bouchier, P., Belgian public mobile R/T service, 3718
Bouix, M., dielectric-rod aerials, 325; modern theories concerning dielectric constant, losses and breakdown, 1692
Boulloud, A., with M. Toitot, discharge between positive point and plane in compressed air, 3265
Bourion, R., semiconductors and oxide cathodes, 1859
Bourrat, J., G. Chaudron and I. Épelboin, effect of dissolved oxygen on magnetic propérties of high-purity Fe, 1034
Boursault, P. A., English-French radio dictionary, 597
Bouvier, P., regional-control radar equipment at Orly, 3316
Bowen, W. A., Jr, with others, 'dynamo' currents and conductivities in ionosphere, 1353
Bowers, R. C., with others, electrical properties of glass-fibre paper, 1719
Bowie, R. M., and D. C. Livingston, N.T.S.C. colour-television transmission system, 3124
Bozorth, R. M., and R. W. Hamming, magnetostriction constants of single crystals, 2045
—— and J. G. Walker, magnetostriction of Co and Ni ferrites, 1399; magnetic crystal anisotropy and magnetostriction of Fe-Ni alloys, 2345
Braaten, A. M., with G. S. Wickizer, field strengths at 93 Mc/s over distances of 40–150 miles, 809
Bracewell, R. N., sunspot number series, 2304
Brackmann, J., and J. Frey, copper eddy-current losses in coils with ferrite cores, 3526
—— with others, measurements on high-μ ferrite cores, 1032
Bradfield, G., ultrasonics in solids, 1884
Bradshaw, J. A., calculation of propagation constants of inhomogeneously filled waveguide, (D)624
Brady, J. J., M. D. Pearson and S. R. Peoples, reflection of microwaves by metal-plate structures, 389; compressional phase shifter for microwave measurements, 1440
Bramel de Cléjoulx, L., international organization of radio communications and frequency allocation, 2785
Bramley, A., and J. E. Rosenthal, field-dependent luminescence of vitreous Zn_2SiO_4 phosphor, 418
Bramslev, G., loop-aerial reception, 35
Brand, F. A., with others, mechanism of field-dependent secondary emission, 998
Brandon, P. S., distortion due to f.m. of oscillator by perfect reactance valve, 3104
Brandt, H., with others, measurements of acoustic properties of building materials, 311
v. Brandt, R., unitary design system for band-pass filters, 3236
Brangaccio, D. J., with C. C. Cutler, factors affecting power capacity of travelling-wave valves, 3751
Branin, F. H., Jr, determination of dielectric constants of absorptive liquids by microwave interferometer, 461
Brattain, W. H., and J. Bardeen, surface properties of Ge, 1698
—— with others, electron-spin resonance in Si semiconductor, 3342
Braun, E. H., gain of e.m. horns, 935
Braun, K., and H. Koschel, reference-level test equipment for telephone circuits, 777
Braun, P. B., crystal structure of $BaFe_{18}O_{27}$, 754
Bray, P. R., power factor and capacitance of mica capacitors at l.f., 1925
Bray, R., with others, lifetime of injected carriers in Ge, 740
Bray, W. J., and R. L. Corke, path attenuation measurement for 4-kMc/s radio-relay links, 1091
—— and D. W. Morris, s.s.b. multichannel operation of s.w. radio links, 2144
Breckenridge, R. G., semiconducting intermetallic compounds, 2688
—— and W. R. Hosler, TiO_2 rectifiers, 229
Brehm, K., power supplies for transmitters, 2454
Breitenhuber, L., exactly integrable cases of coupled cavity resonators, 1621
Brekhovskikh, L. M., scattering of waves at uneven surface, 2968
Bremmer, H., approximate formula for field of magnetic electron lenses, 2099
Bresler, A. D., approximation in network synthesis, 660, (C)2250
Brewer, A. W., wide-range electrometer valve voltmeter, 2079
Brewer, G. R., with others, resistive-wall amplifier valve, 3147
Bridger, G. W., and C. A. Sempers, compact radar test unit, 1445
Bridgewater, T. H., Coronation television arrangements, 2804
Briggs, H. B., and R. C. Fletcher, new infrared absorption bands of *p*-type Ge, 424
Bril, A., and H. A. Klasens, intrinsic efficiencies of phosphors under c.r. excitation, 3607; new phosphors for flying-spot c.r. tubes, 3608
—— with others, single-component white screen for television tubes, 111
Briner, H., and W. Graffunder, geometrical transformation of impedance diagrams, 2576, (C)3494, 2907
van den Brink, G., with C. T. J. Alkemade, stabilized calibrated 50 c/s voltage source, 1424
Brisbane, A. D., with A. H. Beck, cylindrical magnetron ionization gauge, 3000
Brittain, F. H., metal cone loudspeaker, 18, 313; environment of high-quality reproduction, 611; relations between subjective and objective tests on loudspeakers, 2292
Brockelsby, C. F., Wien bridge and applications, 479
Brockman, F. G., with others, neutron diffraction study of Mg ferrite, 3335
Broder, J., and P. H. Keck, solubility of Si and Ge in Ga and In, 3033
—— with others, evaporation of Ge films from carbon crucible, 3032
Broding, R. A., with others, instrumentation for geophysical exploration, 2749
Brodzinsky, A., with others, microwave correlator, 1067
de Broglie, L., Hertzian waves and photons, 709
Bromber, B. G., and R. D. Hill, Jr, reliability of airborne electronic components, 1938
Bronwell, A. B., with H. Burroughs, ionized-gas detector for microwaves, 530
Bronzi, G., new R/T terminal of Centro Radio Nazionale P.T., 2793
Bronzo, J. A., and J. M. Anderson, plastic lenses for high-intensity ultrasonic radiation, 915
—— with R. Truell, ultrasonic-attenuation measurements in Ge, 2694
Brookes, D., with M. B. Williams, cable-fault indicator, 2392
Broom, T., effect of temperature of deformation on resistivity of cold-worked metals and alloys, 1027
Broser, I., and W. Reichardt, effect of pounding on luminescence of ZnS phosphors, 2022
—— and R. Warminsky, electrical conductivity connected with phosphorescence of CdS crystals, 1028, 1374
Brous, J., I. Fankuchen and E. Banks, rare-earth titanates with perovskite

structure, 1717
Broussaud, G., with J. C. Simon, u.h.f. band-pass filters, 1933
Brouwer, D., changes in earth's rate of rotation since 1820, 1332
Brown, D. A. H., photocell amplifier for infrared spectroscopy, 692; equivalent Q of RC networks, 2919, (D)3221
—— and V. Roberts, high-speed infrared spectrometer, 1758
—— R. P. Chasmar and P. B. Fellgett, construction of thermocouples using semiconducting materials, 3376
Brown, D. E., with K. Kandiah, high-gain d.c. amplifiers, 172
Brown, D. R., and E. Albers-Shoenberg, ferrites speed digital computers, 2061
Brown, G. H., and D. G. C. Luck, principles and development of colour-television systems, 3428
—— and O. M. Woodward, Jr, radiation characteristics of conical and triangular aerials, 1239
Brown, H. E., with S. T. Smith, direct-viewing memory tube, 3760
Brown, J., microwave wide-angle scanner, 3484
Brown, J. N., with others, ionosphere recorder for 50 kc/s to 1 Mc/s, 1998
Brown, J. S., and W. Thayer, Jr, high-Q a.f. resonant filters, 351
Brown, R. H., and C. Hazard, r.f. radiation from supernova (A.D.1572), 96
Brown, S., and S. J. Barnett, carriers of electricity in metals with positive Hall effects, 700
Brown, S. C., with W. P. Allis, h.f. breakdown of gases, 83
—— with D. J. Rose, admittance and electron density of h.f. gas discharge, 463
Browne, I. C., and N. P. Robinson, cross-polarization of radar melting-band, [illegible]
Brownlee, L. D., and E. W. J. Mitchell, variations of lattice parameters of semiconducting oxides, 115
Bruce, F. M., special c.r.o. techniques, 3371
Brück, L., phase distortion in travelling-wave valves, 1855; characteristics of electron beam entering coaxial magnetic field, 2638
ten Bruggencate, P., with J. Bartels, Landolt-Börnstein Zahlenwerte und Funktionen aus Physik, Chemie, Astronomie, Geophysik und Technik: Vol. 3—Astronomie und Geophysik, (B)1359
Brühl, G., with others, dm-wave beam radio equipment FREDA I, 2160
Bruijsten, J., H. Groendijk and M. R. Mantz, Type-E80T valve, synchronization of v.f.o. with, 2816, multichannel I.G.O. circuits using, 2817
Bruining, H., improvements in image-iconoscope, 2167
—— with J. C. Francken, developments in image iconoscope, 3733
Brunner, R. H., l.f. function generator, 680
Brust, M. F., with W. J. McKune, subharmonics in series nonlinear circuit, 2929
Bryan, G. W., Jr, transistor h.v. low-current supply unit, 833
Bryant, J. H., T. J. Marchese and H. W. Cole, recent developments in travelling-wave valves, 274
—— with others, low-noise travelling-wave valve, 273, (C)2496
Bube, R. H., electronic transitions in luminescence of ZnS phosphors, 2679
Buchanan, T. J., measurement of high s.w.r., 1070
Buckerfield, P. S. T., parallel-T wide-band d.c. amplifier, 982
Buckland, B. O., transmitting-valve heat-transfer data, 2495
Bückner, H., integral occurring in theory of linear servomechanisms, 832
Budde, W., propagation of space waves, 1774
Budden, K. G., limiting polarization of radio waves reflected from the ionosphere, 1104; propagation of atmospherics, 1108; propagation of very-low-frequency waves, 2773
Buechler, L. W., low-input-power magnetic amplifiers, 833
Bulanova, A. I., M. N. Mikhnevich and V. B. Perets, coercive force of nonuniformly magnetized specimens, 3024
Bulgakov, V. V., realization of correction circuits, 1450
Bull, C. S., space-charge smoothing factor, (A)291, 1196
Bull, E. W., design of deflecting coils for c.r. tubes, 1834
Bullen, J. M., ionospheric-disturbance index, 3302
Bulliard, H., with P. Aigrain, photomagnetoelectric effect, theory of, 2015, measurements of on Ge, 2016
Bullington, K., transmission beyond horizon at 40 Mc/s–4 kMc/s, 1114; frequency economy in mobile-radio bands, 1797, 3713
Buneman, O., circulation in flow of electricity, and Dirac's new variables, 1645
Burgerjon, J. J., with F. A. Heyn, synchrocyclotron at Amsterdam, 3076
Burgess, E., high-altitude research, 728
Burgess, R. E., characteristics and applications of thermistors, 948; contact noise in semiconductors, 2334; influence of mobility variation in high fields on rectifier barriers, 2697
Burgett, M. I., Jr, subjective study of colour-synchronization performance, 3427
van der Burgt, C. M., parameters of magnet strictive vibrations in ferrites, 3624
—— M. Gevers and H. P. J. Wijn, measurement methods for properties of ferroxcube materials, 3060
Burke, P. F. C., with D. C. Rogers, British television relay uses travelling-wave valves, 2330
Burkowitz, P., theory of single-channel transmission of sound, 1229, 1890, 2869
Burnett, J. H., improvement of gas-valve grid-circuit reliability, 2517
Burns, D. O., theorem on linear differential equations, and application to analogue computers, 2721
—— and C. W. Cooper, harmonic-response-testing equipment for linear systems, 3374
Burns, K. N., transient response of single-point nonlinear servomechanism, 3112
Burridge, G. E., and A. S. G. Jong, transmission factors for power-line carrier network, 3704
Burrill, E. A., and A. J. Gale, electron beams sterilize food, 505
Burroughs, H., and A. B. Bronwell, ionized-gas detector for microwaves, 530
Busch, C. W., investigations with pulses on wide-band cables, 2728
Busignies, H., errors in radio navigation systems, 412
Butler, K. H., alkaline-earth orthophosphate phosphors, 3610
Butterworth, J., with others, frequency dependance of mutual conductance of aged oxide-cathode valves, (A)2838
Buttler, W. M., boundary-layer noise, in semiconductors, 3022, in CdS single crystals, 3023
Byrne, J. S., with W. L. Firestone, reduction of distortion in microwave systems, 2788

C

Cacheris, J. C., with others, nonquantized f.m. altimeter, 3311
de Cadenet, M. J., recording panoramic radar images, 2007
Cady, W. G., graphical aids in interpreting the performance of crystal transducers, 3164
Cafferata, H., C. Gillam and J. F. Ramsay, B.B.C. television transmitting aerials, 934
Cage, J. M., and J. C. Schuder, gas-tube inverter for low direct voltages, [illegible]
Cahen, G., perturbations of filtered oscillators, 1279, 1624; nonlinear electromechanical systems, 3556
—— and J. Loeb, pull-in of nonlinear oscillators with filtered output, 972; calculation of attenuation in filtered oscillators, 2449
Cahn, C. R., with H. Hellerman, linear detection of a.m. signals, 208
Cairns, J. E. L., small high-speed-scanning television pickup tube, 853
Calaora, A., with V. Gavreau, absolute calibration of microphones, 3173
Callaway, J., with F. Herman, structure of Ge crystal, 1699
Calliman, T. D., R. T. Lucas and R. C. Bowers, electrical properties of glass-fibre paper, 1719
Camac, M., characteristics of synchrotron beam, 2752
Camillo, C. C., with others, liquid-dielectric r.f. coaxial cables, 3472
Campbell, F. W., with R. S. Styles, radar observations of rain from non-freezing clouds, 2004
Campbell, L. L., with J. R. Wait, fields of dipole in semi-infinite conducting medium, 2109, 3202; effect of large dielectric constant on ground-wave propagation, 2113
Canac, F., interference of ultrasonic beams incident on and reflected by plane wall, 1558; measurement of reflecting power of ceilings, 1896
Cannon, W. W., and L. E. Bloom, analysis of modulated electron beam, 263
Cappeller, U., reproduction of pulses by proportional amplifier, 691
Carbenay, F., correlation between level of atmospherics and intelligibility in km-λ radio link, 105
Carduner, L., 1952 British National Radio Exhibition, 301
Carhart, R. R., reflection of sound from ocean layers with temperature change, 3463
—— with P. S. Epstein, absorption of sound in suspensions and emulsions, 2547
Carleton, J. T., and W. F. Horton, figure of merit of magnetic amplifiers, (A)2580, 2912
Carley, W. S., and E. F. Seymour, high-characteristic-impedance delay lines, 2257
Carlson, E. V., BaTiO$_3$-ceramic vibration pickup, 2399
Carlson, R. S., and J. G. Truxal, synthesis of compensation networks for carrier-frequency servomechanisms, 3115
Caro, D. E., and L. U. Hibbard, wide-range oscillator of high stability, 1628
—— with L. U. Hibbard, instantaneous measurement of rapidly varying frequency, 1428
Carroll, J. M., community aerials bring TV to fringe areas, 859
Carter, R. O., and L. K. Wheeler, phototelegraphy transmitter-receiver using subcarrier f.m., 559
Casimir, H. B. G., symposium on noise, general introduction, 693
Caspary, R., and H. Muser, photoconductivity of CdS crystals at relatively high temperatures, 1687
Cass, N., with H. H. Wieder, f.m. transistor oscillator, 2938
Cassanas, P., and P. Barchewitz, automatic tracer for electron trajectories, 476
Cassidy, G. J. A., with D. L. Hollway, equipment for dielectric measurements at 100–300 Mc/s, 481
Cataldo, J. T., development of 40-V Se rectifier plates, 2457
"Cathode Ray", resonance curves, 675
Cauchois, J., measurements on moving-target radar equipment with fixed-target echo elimination, 1446
Causley, D., with others, flying-spot microscope, 3073
Cayzac, J., with P. Perilhou, stabilized h.v. rectifier unit for 5kV, 50mA, 2300
Cazenave, R., double resonance in secondary of two inductively coupled circuits, 1620
Chai Yeh. See Yeh Chai.
Chait, H. N., wide-angle scan radar aerial using Schmidt system, 938
—— N. G. Sakiotis and R. E. Martin, reduction of loss in ferrite gyrators, [illegible]
—— with N. G. Sakiotis, ferrites at microwave λ, 931
Chalberg, H. W. A., r.f. performance of u.h.f. triode, 1204
Chambers, L. G., calculation of propagation constants of inhomogeneously filled waveguide, (D)624; propagation in waveguides filled with two or more dielectrics, 1907
Chambers, R. G., anomalous skin effect, 1303
—— with A. B. Pippard, mean free path of conduction electrons in Bi, [illegible]
Champeix, R., with others, photomultipliers for counting scintillations, [illegible]
Chandler, D. P., with others, transient response of magnetic amplifiers, 2236
Chaney, J. G., rhombic aerials, free-space radiation impedance of, 2898, coaxial, coplanar, mutual impedance of, 3197; simplification for mutual impedance of certain aerials, 3199
Chang, H., and V. C. Rideout, generalization of modulation spectra, 2790
Chang, S. S. L., semifinite-terminated filters, 2923
Chapelle, J., recent applications of synthetic crystals, 1046
Chaplin, G. B. B., with F. C. Williams, design of transistor trigger circuits, 2914
Chapman, C. L., Ag/Zn accumulator, 3728
Chapman, J. H., winds in the ionosphere, 1996
Chapman, J. J., and others, r.f. properties of 16 insulating materials, 1716
Chapman, S., aurorae, theories of, 1356, geometry of radio echoes from, 1357; morphology of geomagnetic storms, 2645
Chari, S. S., with others, dependence of sonic intensity at source on absorption coefficient in liquids, 2543
Charlesby, A., ionic current and growth of thin oxide layers on Al, 2347
Chasmar, R. P., with others, construction of thermocouples using semiconducting materials, 3376
Chasson, R. L., and M. L. MacKnight, ethylene and ethyl alcohol as quenching agents in external-cathode G-M counters, 2105
Chatten, J. B., with others, colour characteristics of flying-spot signal generator, 2807
Chatterjee, B., effect of geomagnetic field in oblique-incidence ionospheric propagation over equatorial regions, 805; sporadic E regions at different hours over Calcutta, 3292; studies in ionospheric absorption, 3690
Chatterjee, J. S., radiation field of conical helix, 2899
Chatterjee, S. K., perturbation effects in microwave cavities operating in degenerate modes, 360; cavity resonators, as circuit elements, 967, interaction of modes in, 2933
Chaudron, G., with others, effect of dissolved oxygen on magnetic properties of high-purity Fe, 1034
Chavance, P., and P. Salort, thick obstacles in waveguides, 3190
Cheek, R. C., and J. D. Moynihan, carrier-frequency noise on power lines, 3705
Cheng, D. K., and R. A. Galbraith, stagger-tuned multiloop aerials for wide-band l.f. reception, 3207
Chernosky, E. J., variation of geomagnetic-activity recurrence interva with solar cycle, 1335
Chernyi, B. K., with E. V. Singakov, potential distribution in titanate ceramic dielectrics, 439
Cherry, E. C., and G. G. Gouriet, compression of television signals by recoding, 1154
Chesnes, A. A., with R. Dressler, sound-on-film recording using crystal, 2209
Cheston, T. C., and D. H. Shinn, scanning aberrations of radar lenses, 781
Chevallier, R., with others, thermomagnetic properties of haematite, 2706
Chhapgar, A. F., with others, harmonic oscillations of quartz plates, 1619
Chikazumi, S., with others, composition of Cs-Sb photocathodes, 2624
Chipp, R. D., television control-room lay-out, 863
Chippendale, R. A., with J. A. Jenkins, high-speed photography by means of image converter, 2751
Chodorow, M., and S. P. Fan, floating-drift-tube klystron, 1544
—— E. L. Ginzton and E. J. Nalos, debunching of electron beams constrained by strong magnetic fields, 3459
Choudhury, D. C., production of E layer in oxygen-dissociation region of ionosphere, 723
Choudhury, J. K., with F. R. Axworthy, design and application of portable e.s. wattmeter, 1081
Chow, W. F., and J. J. Suran, transient analysis of junction-transistor amplifiers, 3513
Christiansen, J., self-quenching parallel-plate vapour-filled counters, 796
Christiansen, W. N., high-resolution aerial for radio astronomy, 2578
—— and J. V. Hindman, 1·42-kMc/s emission from galactic hydrogen, 718
—— and J. A. Warburton, highly directional aerial system for scanning solar disk, 3298
Churchill, J. L. W., trigger circuits for use with cold-cathode counter tubes, 49
Ciccolella, D. F., and L. J. Labrie, h.f. crystal units for filter networks, 3552
Cini, R., with G. Piccardi, potential in electrically shielded space, 1648
Clark, G. L., with others, interaction of microwaves in gas-discharge plasma, 2637, 2970
Clark, J. R., low-power blocking oscillators, 2936
Clark, P. B., valve circuits without anode supplies, 685
Clarke, C., and E. D. R. Shearman, automatic ionospheric-height recorder, 3356
Clarke, D. S., with others, factors affecting design of mass production television receivers, 1498
Clarke, R. K., Wien bridge oscillator design, 1278
Clarke, T. E., r.f. characteristics of capacitors, (D)51
Clarke, W. W. H., and L. Jacob, characteristics of l.v. electron immersion objective, 2410
—— J. L. Goldberg and J. D. S. Hinchliffe, u.h.f. cable measurement equipment, 2393
—— with others, factors affecting performance of coaxial cables for television lines, 928
Clarkin, W., and L. F. Biosca, valve sockets for industrial equipment, 1880
Clavier, P. J. M., physical explanation of surface wave on dielectric-coated line, 1808
Clegg, J. A., velocity distribution of sporadic meteors, 1010
—— with others, radio reflections from meteor trails, 1979
Clegg, P. L., with D. G. Avery, optical constants of single-crystal Ge, 3344
de Clejoulx, L. Bramel. See Bramel de Clejoulx, L.
Clemmow, P. C., propagation across a boundary separating two media, 3688
—— and C. M. Munford, tables of values of wave-theory function for complex arguments, 444
de Clerck, F., sensitivity of vertical and horizontal television aerials to ignition interference, 1180
Clewell, D. H., and others, instrumentation for geophysical exploration, 2749
Clifford, F. G., feedback amplifiers for relaying television signals over coaxial cables, 984
Cline, J. F., aerial impedance measuring instrument, 830
Closs, R. L., J. A. Clegg and T. R. Kaiser, radio reflections from meteor trails, 1979
Cluley, J. C., with others, measurement of cathode temperature of diodes, 1199
Coblenz, A., and H. L. Owens, temperature variation of transistor parameters, 883; theory and applications of transistors, 1957, 2239, 2827, 3021, 3444, 3523
Cochardt, A. W., origin of damping in high-strength ferromagnetic alloys, 3622
Cocking, W. T., fault interference, (D)255; [illegible] for coil construction, 574; d.c. restoration in television, 1500
Coghlan, A. J. A., Rothman modulation system, 1181
Cohen, E. R., Rydberg constant and atomic mass of electron, 697
Cohen, J. W., and H. Grosser, calculation of leakage flux of pendent-armature relays, 387
Cohn, G. I., e.m. transients in cylindrical waveguides, 2887
—— with G. T. Flesher, dielectric loading for waveguide linear accelerators, [illegible]
Cohn, J., effect of long transmission lines on klystron oscillators, 363
Cohn, S. B., experimental verification of theory of metal-strip delay lens, 3485; microwave measurements on metallic delay media, 3652
—— with K. Tomiyasu, Transvar directional coupler, 2931
Colavita, P. A., compensation of LC circuits by negative-coefficient capacitors, 2603
Cole, A. W., and J. A. Smale, picture transmission by radio, 558
Cole, D. P., and others, phosphor-photocell radiation detector, 1103
Cole, G. H., grain-oriented Si-Fe alloys, 3030
Cole, H. W., with others, recent developments in travelling-wave valves, 274
Colli, L., and U. Facchini, discharge mechanism in Ar counters, 1462
Collins, H., and T. C. Macnamara, electronic camera in film making, 1830
Colls, J. A., d.c. amplifiers with low-pass feedback network, 389
Colombani, A., and M. Gourceaux, h.f. resistance of conducting strip parallel to conducting plane, 80
—— with M. Gourceaux, currents induced in wide conductor by narrow conductor carrying h.f., 81
Colombo, S., Dirac's function in mathematical physics, 2621; pass band, general definition of, 3534, width of and distortion of transient, 3539
Comte, G., and A. Ponthus, measurements of attenuation of TE$_{11}$ waves in circular waveguide, 1068; determination of characteristic impedance of coaxial cables, 2732
Conn, G. K. T., with J. R. Beattie, simple 1–3-c/s oscillator, 2950
Conrath, J. R., magnetic-amplifier gapless-core tests, 471
Conturie, L., 'Pierre Bourdan' low-frequency broadcasting centre, Paris, [illegible]
Convert, G., low-noise travelling-wave amplifier valve, 275
Conwell, E. M., properties of Si and Ge, 788; electron mobility in strong e.s. fields, 1302; high-field mobility in Ge with dominant impurity scattering, 3328
—— with P. P. Debye, mobility of electrons in Ge, 425
Cook, C. C., N.B.S. calibration of commercial field-strength meters, 773
Cook, E., binaural disk recording, 2550
Cook, S. F., dielectric properties of water and of blood at microwave frequencies, 139
Cook, W. R., Jr, and H. Jaffe, ferroelectricity in oxides with fluorite crystal structure, 1874, 2324
Cooper, B. F. C., magnetic-drum digit-storage system, 3646
Cooper, C. W., with D. O. Burns, harmonic-response-testing equipment for linear systems, 3374
Cooper, F. S., and others, experiments on synthetic speech sounds, 919
Cooper, G. R., with E. A. Saunders, meter for coupling coefficient of i.f. transformers, 3658
Cooper, S. R., second-order sampling servomechanism, 3420
Cooper, V. J., television transmitters, comparison of high- and low-level modulation for, 567, high-power, Holme Moss, design of, 1161; transient testing of television apparatus, 1065
Cooperstein, M., servo-system comparators, 3113
—— with A. H. Phillips, modulation index of f.m. signals, 3071
Copeland, K., A. C. Downing and A. V. Hill, moving-coil galvanometer of extreme sensitivity, 2076
Coppola, P. P., with R. C. Hughes, electrical conductivity of oxide emitters, 894; bariated tungsten emitters, 1189
Copson, E. T., propagation of sound waves of finite amplitude in a gas, 1875
Corbett, B. D., volume compression and expansion, (D)686
Cordonnier, J., and M. Bernard, broadcasting-studio installations and new S.F.R. equipment, 826
Cordovés, J. Sanchéz. See Sanchéz Cordovés, J.
Corey, H. E., with others, observations of dislocations in Ge boundaries, 2893
Corfield, D. N., 427/45-Mc/s converter for Television Society's transmissions, 2809, (C)3434
Cork, E. C., suspended locked-coil-rope television-aerial feeder systems, 929
Corke, D. M., aircraft-vibration research, 491
Corke, R. L., with W. J. Bray, path attenuation measurement for 4-kMc/s radio-relay links, 1091
—— with others, design of linear-phase low-pass filters, 1614
Corliss, L. M., J. M. Hastings and F. G. Brockman, neutron diffraction study of Mg ferrite, 3335
Cornell, J. A., and J. E. Sterner, frequency-sweep oscillator for u.h.f. television band, 487
Corrington, M. S., response of tuned circuit to 'ramp' voltage, 2286
Corson, D. R., radiation by electrons in large orbits, 3380
Cosci, G., and K. Fränz, highly stable power supply, 552
Cosgriff, R. L., stabilization of nonlinear feedback control systems, 1761
Cosslett, V. E., J. Nutting and R. Reed, conference on electron microscopy, Bristol, Sept. 1952, 1771
Costas, J. P., synchronous detection of a.m. signals, 528
Couanault, G., with others, 3 signal generators covering range 20–1200 Mc/s, 1064
Couchet, G., Li$^+$ ions, secondary emission under impact of, 394, reflection coefficient of and energy spectrum of secondary electrons, 2631
Coulon, J., circle diagrams for radio systems, 43; some characteristics of quartz crystals, 140
Courant, E. D., M. S. Livingston and H. S. Snyder, strong-focusing synchrotron, 1454
—— and others, origin of 'strong-focusing' principle, 3678
Covill, D. H., frame-scanning output circuits for wide-angle c.r. tubes, 1507
Cowles, L. G., parallel-T RC network, 661
Cox, H. L., Jr, improved lock-in amplifier, 2608
Craig, D. J., with others, single synthetic CdS crystals, 135
Crain, C. M., and J. R. Gerhardt, rapid variations of microwave refractive index of air, 431
—— A. P. Deam and J. R. Gerhardt, measurement of tropospheric index-of-refraction fluctuations and profiles, 1341
Crawford, A. E., ultrasonic tinning for Al, 800; ultrasonic whistles, 1879; metallurgical applications of ultrasonics, 2402
Crawford, G. N., with R. D. Teasdale, cut-off frequency for cylindrical waveguide with coaxial dielectric rod, 2886
Creviston, W., variable power supply unit, 2158
Crompton, E. W., v.h.f. multiband monitor for police and fire-services' transmitters, 544
Cronemeyer, D. C., electrical and optical properties of rutile single crystals, 434
—— with D. H. Rank, infrared absorption of heat-treated Ge, 2678
Crow, R. P., with others, wide-band coupling unit for power-line carrier equipment, 359
Crowther, G. O., cold-cathode voltage stabilizer, (D)1806
Cuccia, C. L., spiral-beam valve modulates 1 kW at u.h.f., 2188, 2500; Harmonics, Sidebands and Transients in Communication Engineering, as studied by the Fourier and Laplace Analyses, (B)3719
Cuker, S., improved blanking circuit, 572
Cullen, A. L., general method for absolute measurement of microwave power, (D)1071; microwave vibration-type wattmeter, 1442
—— and J. M. Stephenson, torque-type wattmeter for 3-cm microwaves, 1082
Cullington, A. L., geomagnetic secular variation in New Zealand, 3282
Culver, R., extrapolation techniques with network analogue solutions, 1418
Cunliffe, A., with others, dielectric constant of water films, 1040

Cunningham, W. J., precision voltage source, (D)168
Curie, D., capture and recapture of electrons in phosphorescence, 1643, 2624
Currie, B. W., P. A. Forsyth and F. E. Vawter, radio reflections from aurorae, 3308
—— with R. E. Jensen, orientations of auroral displays in Canada, 3307
—— with others, scattering of 56-Mc/s radio waves from lower ionosphere, 2118
Curtis, K. K., and L. N. Hadley, acoustical interference filters, 912
Curtis, R. C., noise test for magnetic recording media, 2877
Cutler, C. C., and D. J. Brangaccio, factors affecting power capacity of travelling-wave valves, 3751
Cutler, S., R. O'Neill and H. M. Thaxton, application of ergodic hypothesis in calculating autocorrelation function of teleprinter signals, 537
—— with others, autocorrelation function from ergodic hypothesis, 535
Cutteridge, O. P. D., four-terminal networks, 1264
Cutting, A. B., with A. H. Beck, reflex klystrons for cm-wave links, 1546
Cutts, F. W., mobile high-power microwave link for vision and sound, 1159
Czyzak, S. J., and others, single synthetic CdS crystals, 135

D

Daams, H., dead time of G-M counter, 1464
Daboni, L., calculation of capacitance of cube, 2639
Dacey, G. C., space-charge-limited hole current in Ge, 3329
—— and I. M. Ross, unipolar field-effect transistor, 3445
Daguet, J., synchronization of amplitude-limited oscillators, 1943
Dahlke, W., design charts for planar triodes, 2514
—— with others, measurement of flicker-effect constants, 2725
Dalbert, R., measurement of dielectric properties at 80 c/s–40 Mc/s, 3057
Dalfonso, J., power requirements for transistor circuits, 2797
Dällenbach, W., wave propagation between parallel diaphragm-loaded reflector planes, 3189
Dalman, G. C., design features of 14·5–17·5-kMc/s reflex klystron, 2853
D'Altroy, F. A., and H. Y. Fan, microwave measurements on Ge, 3618
Dammers, B. G., performance of pentode output stages, 1636
—— and others, effects due to curvature of valve characteristics, 1854
—— with others, new trends in a.m./f.m. receiver design, 2427
Daniel, E. D., effect of head and tape constants on magnetic-tape record, 2555
—— and P. E. Axon, reproduction of signals recorded on magnetic tape, [illegible]
Daniel, J., with others, stability of control systems, 1489
Danko, S. F., auto-sembly technique of circuit fabrication, 355
—— and R. A. Gerhold, printed circuits for transistors, 674
Danzer, H., oscillation build-up phenomena, 1626
von Dardel, G., E. Hellstrand and C. Taylor, synchronization of pulsed high-energy ion beams, 1448
Darden, B. R., Jr, simple method of coupling toroidal coils, 3554
Date, M., with others, permittivity and permeability of ferrites at 6·6-cm λ, (C)1401
Dauphin, A., bibliography on arithmetical pulse counters, 649
Dauphinee, T. M., isolating potential comparator, 3064
Danvillier, A., e.s. field at Khartoum during solar eclipse 25th Feb. 1952, 164
Davenport, W. B., Jr, signal/noise ratios in band-pass limiters, 3401
David, J. P., with M. Perrot, deviations from Ohm's law in thin metal layers, 2685
Davids, N., theoretical group heights of reflection of 150-kc/s radio waves, 516
Davidson, J. A. B., with others, recent developments in phototelegraphy and facsimile transmission, 557
Davies, B. F., differential amplifier, (D)1637
Davies, J. G., with others, velocity distribution of sporadic meteors, 1009
Davis, J. K., E-C coated glass resistors, 1253
Davis, R. C., Type-154A glide-slope receiver, 413; prediction of non-stationary stochastic processes, 445
Davison, P. W., with others, two new photomultipliers for scintillation counting, 286
Davy, N., and N. H. Langton, external magnetic field of single thick plate, 2293
—— with N. H. Langton, field above and below infinite corrugated sheet, 2985
Dawe, P. G. M., with G. W. Morris, band-pass filter for 8–13 c/s, 3237
Dawson, G., portable equipment for microwave television link, 1158
—— with others, circuit technique for f.m. microwave links, 220
Dawson, J. W., Ge diodes sealed in glass, 1849
Day, G. A., radar observations of rain at Sydney, N.S.W., 3312
Day, J. P., with others, propagation phenomena on microwave line-of-sight links, 1785
Deam, A. P., with others, measurement of tropospheric index-of-refraction fluctuations and profiles, 1341
Dean, C. E., with R. J. Lindeman, tuner for u.h.f. television band, 1166
Deards, S. R., matrix elements of passive networks, (D)3227
Dearing, J. B., and others, multiple television and f.m. aerial system, 1589
Deatherage, B. H., with others, masking of tones by noise as function of interaural phase, 9
Deb, S., nitrogen in the upper atmosphere, 402; current division in planar positive-grid triode, 1533
De Barr, A. E., digit storage using ferromagnetic materials, 3355
Debye, P. P., and E. M. Conwell, mobility of electrons in Ge, 425
Dedell, T. R., magnetic sound tracks for motion-picture film, 2208
Dehmelt, F. W., with J. Malsch, apparatus for drawing Ge single crystals, 2707
Deibert, C. R., F. T. Turner and R. H. Snider, high-speed direct-scanning facsimile system, (A)841, 3780
Deise, L. F., and H. J. Morrison, high-power a.f. amplifiers, 2948
Delattre, P. C., with others, experiments on synthetic speech sounds, 919
Delcroix, J. L., magnetron in cut-off state, 1210
Dell, H. A., pulse-operated timebases, 1630
Delobeau, F., $F_{1.5}$ layer at Dakar and motion of sun, 1347
Delrieu, A., tests of electrical equipment under tropical conditions, 1713
Demus, E., testing television studio equipment by means of variable-phase pulses, 3373
Denis, M., travelling-wave-valve feedback oscillators and theory of reflex travelling-wave valve, 276
Denisov, N. G., propagation of e.m. signals in ionized gas, 198
Denisse, J. F., geomagnetic activity, and solar radio activity, 1011, control of by sunspots, 2642
—— E. J. Blum and J. L. Steinberg, radio observations of eclipses on 1st Sept. 1951 and 25th Feb. 1952, 94
Dennis, N. T. M., with others, working fluids for diffusion pumps, 1686
Dent, H. B., two-range test oscillator, 485
Denton, R. F., T. A. Wilson and A. R. Margolin, a.f.c. of high-power klystrons, 2942
Deppermann, K., and W. Franz, theory of diffraction by cylinder, taking account of surface wave, 1665
Deryugin, L. N., distribution of current in disk rotating in magnetic field, 1313
Desoyer, K. V., motion of ferromagnetic particles in rotating magnetic field, 1664
Destriau, G., excitation of luminescence by variable electric fields, 3255; electroluminescence, a new source of light, 3256
Deutsch, J., and O. Zinke, screening of test rooms and instruments from e.m. fields, 3116
Deutsch, K. H., television in Great Britain, 3732
Deutsch, S., design of unequal-Q double-tuned transformers, 3499
Dexter, G. B., Russian radio and electronics, 2525
DeVore, H. B., photoconductivity study of activation of BaO cathodes, 1528
DeWolf, N., testing u.h.f. mixer crystals, 2063
Dickenson, C. R., telecommunications in New Zealand, 1119
Dickey, J., with others, electron scattering and photoemission from Cs_3Sb, 1690
Dickinson, F. R., with others, amplifiers for L3 coaxial-cable system, 3411
Dickinson, J. T., international monitoring station at Jurbise-Masnuy, 3416
Dickson, A. W., use of servo techniques in design of amplitude-stabilized oscillators, 2937
—— and W. P. Murden, vibrating-wire high-Q resonator, 3561
Dickson, F. H., and others, v.h.f. transmission over mountainous path, 3396
Dickson, J. H., radar chart-matching devices, 1052
Dickten, E., with others, junction-transistor tetrode for h.f., 677, 1184
Diebold, B. A., with A. W. Rogers, components and materials for reliable electronic equipment, 2261
Diemer, G., valve noise at v.h.f., 907
—— and K. S. Knol, valve noise at v.h.f., 3758
—— with K. S. Knol, h.f. diode admittance with retarding field, 290
—— with others, rubber-membrane model for electron paths, 3756
Dieminger, W., causes of excessive absorption in ionosphere on winter days, 519
Diestel, H. G., with E. Meyer, room acoustics investigations with directive transmitters and receivers, 12
Dietrich, E., radio links in U.S.A., 545
Dike, S. H., difficulties with present solutions of Hallén's integral equation, 633
—— and D. D. King, gain and back-scattering cross-section of cylindrical aerial, (D)2894
Dikhoff, J. A. M., with others, single-component white screen for television tubes, 111
Dingle, R. B., magnetic properties of metals, 1004, 1005; solution of Schrödinger equation for special cases of electron motion, 1648; magnetic properties of cylindrical system of electrons, 1967
Dippner, H., and H. J. Zemke, reverberation times of Berlin auditoria and sound-recording studios, 3467
Dishal, M., alignment of multiple-resonant-circuit filters, (C)1268; minimum number of resonators and minimum no-load Q required in filters, 3543
Ditzenberger, J. A., with C. S. Fuller, diffusion of Li into Ge and Si, 3628
Dixon, G. J., with R. F. Hansford, remote display of radar pictures, 2005
Doak, P. E., reflection of spherical acoustic pulse by absorbent infinite plane, 914
Dobrin, M. B., with others, instrumentation for geophysical exploration, 2749
Dobson, D. A., with R. E. Beam, dual-dielectric coaxial waveguide, 2885
Dobson, G. M. B., ozone in earth's atmosphere, 1015
Dodds, W. J., R. W. Peter and S. F. Kaisel, developments in travelling-wave valves, 1524
Doehler, O., with others, amplification by space-charge waves, 278, oscillations in whole-anode magnetron related to, 904; natural oscillations and mode changes in multicavity magnetrons, 1543; new magnetron oscillator with interdigital circuit, 2187
Doelz, M. L., and J. C. Hathaway, electromechanical i.f. filters, 1615
Doherty, S. N., E. Jones and B. R. Overton, television valves and a.c./d.c. receivers, 1503
Dolan, W. W., with others, field emitter, 3082
Doland, G. D., servomechanism theory applied to television a.f.c. circuit design, 3119
Dolgikh, G., with others, electrical properties of Sb_2S_3 and Bi_2S_3, 3019
Domb, C., tables of functions in theory of diffraction of e.m. waves by the earth, 1777
Dominici, P., measurement of ionospheric absorption, 2661
—— with A. Bolle, calculation of ionospheric absorption of short waves, 1351
Doolittle, H. D., design of high-power valves for industrial heating applications, 3759
Doremus, J. A., R. P. Crow and W. H. Freeman, wide-band coupling unit for power-line carrier equipment, 359
Dorgelo, E. G., 100-kW transmitting valves with thoriated-tungsten filaments, 2841
Dormont, H., calculation of contact potentials, 2286, 2287
—— and E. Morilleau, photomultipliers and detection of nuclear particles, 3748
—— with others, photomultipliers for counting scintillations, 2181
Doty, R. L., with L. W. von Tersch, automatic ejection from betatrons and synchrotrons, 3677
Douglas, A., 'chord' organ, 616
Dow, O. E., time-division multiplex terminal equipment, 212
Dow, W. G., with others, dynamic probe measurements in ionosphere, 3291
Dowd, J. J., with E. Billig, *p-n* junction revealed by electrolytic etching, [illegible]
Downing, A. C., with others, moving-coil galvanometer of extreme sensitivity, 2076
Drechsler, M., and E. W. Müller, field electron emission of crystal surfaces, 1963
Drenick, R., servomechanism requiring variable elements, 1800
Dressler, R., post-deflection-focusing chromatron, 3131
—— and A. A. Chesnes, sound-on-film recording using crystal, 2209
Drexler, G., and H. H. Voss, multistage band-pass filter with optimum approximation to rectangular response curve, 1613
Dreyfus-Graf, J., phonetic typo-sonograph, 1568
Dropkin, H. A., with others, nonquantized f.m. altimeter, 3311
Dröscher, G., with H. Ehlers, Hinsbeck relay station for television of Coronation, 3425
Druet, Y., bistable high-speed switching circuit, 648
Druzhinin, V. V., and R. I. Yanus, anisotropy of coercive force in single crystals of Si-Fe alloys, 2704
Drysdale, C. V., and A. C. Jolly, Electrical Measuring Instruments Part 1, (B)2598
Duerdoth, W. T., design of amplifiers for Birmingham/Manchester coaxial cable, 977
Duffin, W. J., 3-probe method of microwave impedance measurement, 462
Duffy, P. A., with others, phosphor-photocell radiation detector, 1103
Dufour, C., and A. Herpin, propagation of e.m. waves in transparent periodically stratified medium, 3589
Dufour, J., directional reception pattern of rhombic aerials, 1912; u.s.w. propagation over the Alps, 3397; u.s.w. propagation and meteorology, 3651
—— with H. Laett, the Dôle as site for television transmitter, 2166
Dugas, C., with P. Aigrain, physical properties and radio applications of semiconductors, 1703
Duhamel, R. H., optimum patterns for endfire arrays, 2225
Duinker, S., graphical analysis of steady-state response of nonlinear networks, 3546
Dujardin, I., and others, electronic tachometer, 2747
Dukat, F. M., and I. E. Levy, cathode-interface effects in television receivers, 2505
Düker, H., with G. Möllenstedt, emission-microscope surface images obtained with electrons due to oblique bombardment by ions, 2757
Dumas, G., with M. Bayet, operation of Penning gauge, 2634
Dummer, G. W. A., and D. L. Johnston, printed and potted electronic circuits, 2926
Dumontet, P., amplifier for weak photoelectric currents, 329
Dumoré, J. M., with others, temperature distribution at end of hot wire, 283
Dunbar, A. S., theory of aerial-beam shaping, 31; effects of astigmatism on diffraction pattern and gain of microwave lens, 1597
Duncan, D. B., response of linear time-dependent systems to random inputs, 2856
Dungan, R. H., D. F. Kane and L. R. Bickford, Jr, lattice constants and dielectric properties of $BaTiO_3$-$BaSnO_3$-$SrTiO_3$ ceramics, 1718
van den Dungen, F. H., integral variant associated with wave equation, 144
Dungey, J. W., theories of magnetic storms and aurorae, 1013
Dunkley, R. A. G., with others, circuit technique for f.m. microwave links, 220
Dunlap, W. C., Jr, with J. S. Saby, impurity diffusion and space-charge layers in fused-impurity semiconductors, 3020
Dunn, S. C., screen dissipation of pentodes, 294; *RC* cathode-follower feedback circuits, 662; termination variation in constant-*k* filters, 3233
Dunning, K. L., with others, portable 250-kV accelerators, 3679
Dunsheath, T. J., with J. A. M. Lyon, correlation of temperature and electric-field strength during dielectric heating, 500
Durand, E., determination of electron trajectory, 2096, by successive integrations, 1767; general solutions of Maxwell's equations, 2294
Durand, E., with others, portable 250-kV accelerators, 3679
Durand, S. L., with E. A. Kunz, rules of similitude for magnetic amplifier systems, 334
—— with others, effective feedback ratio of magnetic amplifiers, 3510
Durandeau, P., measurement of axial field of magnetic electron lens, 1743
Dusailly, J., electronic control of soldering machines, 198
Düsing, W., hermetic glass/kovar seals, 2711
Dussaussoy, P., with J. Bleuze, sealing by optical polishing, 141
Dussine, R., bibliography on storage systems in digital computers, 3648
Dutta, A. K., relaxation mechanism of ultrasonic absorption, 804
Dutton, J., S. C. Haydon and F. L. Jones, time lags in electrical breakdown of gases, 3262
D[illegible], G. P., [illegible] magnetostriction in strong fields, 3028
Dyall, W. T., G. R. Gardner and M. D. Harsh, improved 'graphechon' storage tube, 1539, 2880
Dyatlovitskaya, B. I., photoelectric effect in Sb-Cs cathodes, 418
Dyke, W. P., and others, field emitter, 3082
Dykman, I., Kiev conference on cathode electronics, 892
Dyott, R. B., launching of e.m. waves on a cylindrical conductor, 320
Dzhakov, E., formulae for saturation current of diodes, 2513
Dzimianski, J. W., with others, r.f. properties of 16 insulating materials, 1716

E

Early, J. M., effects of space-charge-layer thickness in junction transistors, 874
Earp, C. W., recent development in communication technique, 2433
Eaton, J. E., spherically symmetrical microwave lenses, 1596
Ebel, H., perception of a.m. tones, 1883
—— and P. Maurer, new anechoic chamber of Technische Hochschule, Karlsruhe, 1889
Ebers, J. J., 4-terminal *p-n-p-n*-junction transistors, 878
Eckardt, W., pulse oscillograph, 3667
Eckart, C., scattering of sound from sea surface, 2541
Eckart, F., luminescent layers with polyvinyl alcohol as protective colloid and binder, 2955; noise measurements on thin PbS layers, 3003; development of secondary-electron multipliers, 3139
Eckart, G., echoes of acoustic waves in stratified troposphere, 1880
—— and P. Liénard, electrical and acoustical characteristic impedances, and echoes in stratified media, 4
Edelman, S., with others, long-tube method for determination of sound absorption, 13
Edson, W. A., Vacuum Tube Oscillators, (B)2618
—— and R. D. Teasdale, susceptance slope and selectivity in oscillator design, 2928
Edwards, L. C., COZI communication-zone indicator, 3600
Edwards, P. J., search for perfect raster, 3439
Effemey, H. G., with H. M. Barlow, multichannel switch for microwave circuits, 1252
Efrussi, Y. M., with B. D. Tartakovski, testing sound-absorbing materials, 3466
Egli, J. J., u.h.f. relay engineering, 1126
—— with others, v.h.f. transmission over mountainous path, 3396
Ehlers, H., and G. Dröscher, Hinsbeck relay station for television of Coronation, 3425
Ehmert, A., d.c. amplifiers with negative feedback, 1960
—— and R. Muhleisen, high-resistance direct-voltage valve voltmeter for ± 500 V, 2078
Ehrbar, R. D., with others, L3 coaxial-cable carrier system, 3409
Ehrenspeck, H. W., input impedance of thick cylindrical aerials, 1235
Ehrlich, M. J., with L. L. Bailin, factors affecting performance of linear arrays, 1241
Eich, P., broadcasting station on the Hoher Meissner, 222
Eichacker, R., determination of network parameters at v.h.f., 1435
Eicke, H., with A. Schulze, Au-Cr standard resistors, 772
Eisenberg, A., comparative absorption-coefficient measurements, 1570
Eisenmann, L., electrical and optical properties of copper sulphides, 1028
Eisenstein, A., H. John and J. H. Affleck, double activators in oxide-cathode base alloys, 3152
Ekelöf, S., and others, integrating amplifier for c.r.o. recording of magnetic flux, 3062
Ekstein, H., and T. Schiffman, response of linear network to frequency-sweep input, 664
Elghozi, G., a problem of radio d.f., ionospheric anisotropy, 2318
Eliason, M. C., and W. G. Hornbostel, acoustic firing-error indicator, 192
Elkind, M. M., ion optics of long h.v. accelerator tubes, 2089
Ellenwood, R. C., and E. H. Hurlburt, determination of impedance with double-slug transformer, 774
—— and W. E. Ryan, u.h.f. matching termination, 1073
Elliot, E. W., with G. J. Hunt, sine-squared pulse, 3377
Elliott, W. S., design of cavity-type power amplifier, 2949
Ellis, G. R., F-region triple splitting, 3295
Ellison, C. H., with others, portable 250-kV accelerators, 3679
Elmendorf, C. H., and others, L3 coaxial-cable carrier system, 3409
Elsas, A., and E. Vogt, reversal of sign of magnetostriction by expansion, 1711
Elsner, H., metallized-paper capacitors, 344
Elson, D. W., with E. G. Hamer, a.f. combining system for space-diversity receivers, 2426
van Embden, H. J. Meerkamp. See Meerkamp van Embden, H. J.
Emerson, W. H., with others, properties of ferrites at v.h.f., 1312
Emms, E. T., theory and design of cathode-follower output stages, 3247
Endres, R. O., with others, transistor oscillators, 45
Enenstein, N. H., and M. E. McMahon, pulse response of junction transistors, 3514
Ener, C., A. F. Gabrysh and J. C. Hubbard, ultrasonic velocity and absorption in air, 7
Eng, J. W., with W. H. Hannahs, production control of printed resistors, 47
Engberts, D., voltage conversion at high power, 1490
Enge, H. A., combined current integrator and microammeter, 1431
Engelberger, J. F., and H. W. Kretsch, electromechanical transducer for [illegible], 2412
Engelmann, R. H., with D. D. Grieg, microstrip for kMc/s range, 62, 2212
England, R. D., and W. E. Ogle, betatron monitor and integrator, 3754
Enkel, F., memory for acoustic effects, 306; electroacoustic production of sound effects, 3177; supervision of electroacoustical equipment in Cologne broadcasting centre, 3717
Ensing, L., and H. J. J. van Eyndhoven, oscillator with constant output voltage, 2939
Épelboin, I., with others, effect of dissolved oxygen on magnetic properties of high-purity Fe, 1034
Epstein, D. W., colorimetric analysis of R.C.A. colour-television systems, 3429
Epstein, H., and O. Stram, magnetostrictive ultrasonic delay line, 2067
Epstein, J., and D. W. Peterson, field-strength surveys for u.h.f. television, 523; experimental study of wave propagation at 850 Mc/s, 2423
Epstein, P. S., and R. R. Carhart, absorption of sound in suspensions and emulsions, 2547
Erginsoy, C., energy states of impurity carriers, 1382
Erickson, A. M., with D. M. Beard, auditorium designed for technical meetings, 610
Erny, M., resistance of thin Pt films subjected to direct voltage, 3577
Esaki, L., thermal treatment of Si rectifiers, 1714; properties of heat-treated Ge, 2338; resistivity and thermionic emission of Si, 3333
Esan, A., characteristics of parabolic reflectors in absorbing media, 3206
Esche, R., ultrasonic absorption in animal tissues and plastics, 1562
Eshbach, J. R., and M. W. P. Strandberg, Zeeman-effect measurements on microwave spectra, 1318
Eshleman, V. R., with others, transmission by reflection from meteoric ionization, 2117
Espersen, G. A., and B. Arfin, 3-cm magnetron for beacons, 2186
Esselman, W. H., steady-state analysis of self-saturating magnetic amplifiers, 2235
Essen, L., stable microwave oscillator for measurement of variations of atmospheric refractive index, 1085; refractive indices of water vapour, air, O_2, N_2, H_2, D_2 and He at 9·2 kMc/s, 2062; 1953 Washington conference on h.f. electrical measurements, 3651
Estrabaud, S., effects of solar eclipse, 25th Feb. 1952, on F_2 region over equatorial Africa, 1827, on E region over equatorial Africa, [illegible]; investigation of ionospheric absorption, (D)3305
Ettinger, G. M., magnetic amplifier with high input impedance, 336
Etzold, H., storage methods of sound measurement, 3464
Euler, J., electrets, 74
Evans, J. H., noise factor of cm-wave superheterodyne receivers, 1790
Everett, R. R., Whirlwind I computer, 446
Everhart, E., and P. Lorrain, Cockcroft-Walton voltage-multiplying circuit, 2151
Ewen, A. B., with F. C. Owen, [illegible] multichannel operation of s.w. radio links, 2175
Exner, M. L., [illegible] of rubber and steel springs, 668
—— [illegible], 2534
Eyring, R. [illegible], 405
van Eyndhoven, H. J. J., with L. Ensing, oscillator with constant output voltage, 2939

F

Facchini, U., with L. Colli, discharge mechanism in Ar counters, **1462**
Fadner, G. R., with others, improved 'graphechon' storage tube, **1539**, **2845**
Fagen, M. D., performance of ultrasonic vitreous-silica delay lines, **347**
Fahnestock, J. D., transistor hearing aids, **1903**
Fahrnkopf, C. D., with others, radio interference tests in field and laboratory, **2431**
Fairweather, A., metallic contacts at low voltages in adverse environments, **3496**
—— F. F. Roberts and A. J. E. Welch, structure and properties of ferrites, **2043**
Falkenhagen, H., and G. Kelbg, optical method for determining permittivity and permeability, **995**
Fan, H. Y., with F. A. D'Altroy, microwave measurements on Ge, **3618**
—— with others, lifetime of injected carriers in Ge, **740**; grain-boundary barriers in Ge, **1406**
Fan, S. P., with M. Chodorow, floating-drift-tube klystron, **1544**
Fanguin, R., with G. Raoult, frequency-stabilized u.h.f. discriminator, **2386**
Fankuchen, I., with others, rare-earth titanates with perovskite structure, **1717**
Fannin, B. M., Sommerfeld's surface wave, **(D)3391**
Farley, B. G., dynamics of transistor negative-resistance circuits, **641**
Farr, K. E., compatible colour-television receiver for N.T.S.C. system, **1501**, **3130**
Fassbender, J., and B. Seraphin, growth and decay of photoconductivity of CdS single crystals, **1688**
Fastert, H. W., with G. Bangen, fundamentals of probability theory, **197**
—— with F. von Rautenfeld, problems of u.s.w. coverage, **2139**
Faulkner, H., permanent cable and radio links for television relays, **1142**
Favre, R., and C. Haenny, construction and characteristics of Maze-type counters, **2106**
Fechner, P., study of magnetron in cut-off condition, **594**
Fegert, H., phase bridge for measurements on television apparatus, **2391**
Feher, K., with A. Schoch, investigation of sound transmission through partitions, using models, **609**
Feinstein, J., atmospheric reflection of e.m. waves at refractive-index gradients, **1780**; decay of meteor trail, **1977**; wave propagation in anisotropic inhomogeneous medium, **3393**
Feldman, C., protection of Mo films by SiO coatings, **429**
—— and B. Vodar, conduction of Pt films covered with dielectric layers, [illegible]
Feldtkeller, R., change of shape of hysteresis loop of transformer sheet, **126**; perception of nonlinear distortion in combined tones, **304**
—— and O. Kolb, complex permeability of high-μ ferrite core, **1705**
—— and G. Sorger, magnetic after-effects, **2041**
Felker, J. H., digital computer, regenerative amplifier for, **769**, transistor units for, **1729**
Fellgett, P. B., with others, construction of thermocouples using semiconducting materials, **3376**
Felsen, L. B., and N. Marcuvitz, slot coupling of rectangular and spherical waveguides, **3193**
Felsenheld, R. A., with others, high-gain loop aerial for television broadcasting, **1236**
Ferber, L. W., with G. A. del Valle, wear of magnetic heads, **2203**
Ferguson, A. E., parameters of four-terminal network, **2252**
Ferrero, M., and G. G. Sacerdote, measurement of acoustic impedance, **2545**
Ferris, H. G., effect of viscous dissipation in spherical acoustic resonator, **1564**, **(C)3172**
Fert, C., paraxial electron trajectories in e.s. lenses, **510**
—— and R. Saporte, electron miscrocopy by reflection, **1457**
Fesenko, E. G., with others, dielectric properties of BaTiO$_3$ single crystals, **3009**
Fetzer, V., numerical calculation of filters, with generalized parameters, **(C)56**, of Tchebycheff type, **668**
Feuer, P., electronic states in crystals under large perturbations, **736**
Feyer, J. A., impulse e.m. fields, **(D)1591**
Fialkow, A. D., and I. Gerst, maximum gain of *RC* network, **1606**
Fick, H., fundamentals of f.m. by means of reactance units, **2820**
Fife, S. L., critical capacitance coupling for television sound reception, **1831**
Figour, H., and H. Bonnel, quality estimation for powdered Zr getter material, **3034**
Finch, H. W., with M. G. Hammett, β-particle and γ-ray thickness gauges, **496**
Finch, T. R., and R. W. Ketchledge, equalization and regulation in L3 coaxial-cable system, **3410**
Finck, M., and F. Pepping, radio communications on German railways, **210**
Finden, H. J., developments in frequency synthesis, **2376**
Findlay, J. W., moving clouds of ionization in E region, **2310**
Fine, H., theory of radio scattering in randomly inhomogeneous atmosphere, **1468**; variation of field strength over irregular terrain in u.h.f. television band, **1786**
Fine, M. E., vibralloy, a ferromagnetic alloy, **124**; elasticity and thermal expansion of Ge, **2348**
Fine, S., with others, nonlinear filtering and wave-shape multiplexing, **670**
Fink, D. G., synchronization in colour television, **2464**
Finke, H. A., and F. Blecher, wide-band frequency-sweep generator for testing television equipment, **486**
Finlayson, D. M., V. A. Johnson and F. M. Shipley, low-temperature Hall curve for *n*-type Ge, **426**
—— with H. M. Barkla, properties of KH$_2$PO$_4$ below Curie point, **2047**
Finn, D. L., approximate determination of arctan ω with a linear electrical network, **3641**
Finzi, L. A., and H. L. Durand, rules of similitude for magnetic-amplifier systems, **334**
—— and G. F. Pittman, Jr, comparison of methods of analysis of magnetic amplifiers, **2910**
—— D. P. Chandler and D. C. Beaumariage, transient response of magnetic amplifiers, **2236**
—— G. F. Pittman, Jr, and H. L. Durand, effective feedback ratio of magnetic amplifiers, **3510**
Firestone, W. L., and J. S. Byrne, reduction of distortion in microwave systems, **2788**
Fischer, D., focusing properties of radially decreasing magnetic field with cylindrical electric field, **1460**
Fischer, F. A., acoustic radiators, absorption surface of, **1220**, directivity and amplitude distribution of, **1221**
Fischer, J., and J. Marshall, Type-6BN6 gated-beam valve as fast coincidence counter, **512**
Fischer, K., dependence of signal/noise ratio of s.w. receivers on input voltage, **2125**
Fisher, D. H., P. A. Segrave and A. J. Watts, design of superheterodyne receiver for television, **1504**
Fisher, F. J., with others, equipment for impedance matching and measurement at v.h.f., **1747**
Fisher, J. F., generation of N.T.S.C. colour signals, **1822**
—— with others, colour characteristics of flying-spot signal generator, **2807**
Fisher, L. H., with G. A. Kachickas, time lags of field breakdown in N$_2$, **1308**
Fitzosborne, F. J., activation of BeCu multipliers, **1517**
Flammer, C., variational methods for periodic lattices and artificial dielectrics, **2325**
Flanagan, T. P., spurious f.m. in signal generators, **3562**
Flater, E., and K. Fränz, electronic multiplier using modulated pulses, **1417**
Fleischmann, R., and R. Kollath, method for measuring charge of fast electrons, **2957**
Fleisher, H., with L. P. Hunter, graphical anlaysis of transistor switching circuits, **653**
Flesher, G. T., and G. I. Cohn, dielectric loading for waveguide linear accelerators, **2408**
Fletcher, R. C., with H. B. Briggs, new infrared absorption bands of *p*-type Ge, **424**
Flint, H. T., and E. M. Williamson, relation of quantum theory to gravitation and electromagnetism, and application to theory of electron, **3579**
Flood, J. E., time-division multiplex systems, **1793**
Florentin, J. J., with others, temperature variation of magnetization of Ni, **1033**
Floyd, C. F., R. L. Corke and H. Lewis, design of linear-phase low-pass filters, **1614**
Flügge, S., integration of oscillation equations, **1413**
Fogel, H., and S. Napolin, cavity tuner for u.h.f. television, **1506**
Fogelberg, C. V., and others, c.r. tubes with internal pole pieces, **257**
Follingstad, H. G., J. N. Shive and R. E. Yaeger, optical encoder and digit register using transistors, **766**, **2373**
Folsom, R. A., Jr, with E. M. T. Jones, circular dielectric-disk aerial, **2572**
Foner, S., Hall effect in Ni ferrite, **1398**
—— and E. M. Pugh, Hall effect of Co-Ni alloys and armco iron, **3625**
Fontaine, J., with L. Lahure, radio equipment and navigation aids aboard ship, **3418**
Ford, G. T., and E. J. Walsh, high-transconductance tubes for broad-band telephony, **293**
Ford, J. R., with others, analysis of microwave-aerial side-lobes, **41**, [illegible]
Forrer, R., effective magnetic distances in metals and alloys, **1393**
Forsberg, N., and P. Isberg, 1-MV van de Graaff generator for ion accelerator, **184**
Forsgren, S. K. H., calculations of ray paths in ionosphere, **3093**
—— and O. F. Perers, recording of rain by radar, **2994**
—— with others, microwave propagation in optical range, **3097**
Forsyth, P. A., radio measurements and auroral electron densities, **1999**
—— B. W. Currie and F. E. Vawter, scattering of 56-Mc/s radio waves from lower ionosphere, **2119**
—— with others, radio reflections from aurora, **3308**
Fowler, C. S., with others, precision phase comparator for l.f., **(A)483**, **1080**; measurement of phase velocity of 127·5-kc/s ground wave, [illegible]
Fowler, V. J., transmission-line valves, **269**
Fox, A. G., with M. T. Weiss, magnetic double refraction at microwave frequencies, **755**
Frachebourg, C., international Electrical Engineering U.D.C. Committee, Copenhagen 1952, **2191**
v. Fragstein, C., reciprocity of transmission of e.m. waves through multi-layered media, **90**
di Francia, G. Toraldo. See Toraldo di Francia, G.
Franck, E. W., with E. Schmidt, manufacture of magnetic recording materials, **2204**
Francken, J. C., and H. Bruining, developments in image iconoscope, **3733**
François, P. A., radio and television at Paris Fair, **3398**
Frank, M., improvements in facsimile equipment, **1492**
Frank, R. L., harmonic-insensitive rectifiers for a.c. measurements, **3662**
Frank, R. W., wide-range pulse generator, **3672**
Frank, V., geometrical arrangement in Hall-effect measurements, **3054**
Frankcom, C. E. N., navigational work in ocean weather ships, **1023**
Franken, B., and others, influence of magnetic field on resistance of Fe films, **1039**
Franklin, A. D., and A. E. Berkowitz, approach to saturation in dilute ferromagnetic materials, **2337**
Franz, H. J., with H. Göttlich, new I.K.A. cables, **617**
Fränz, K., with G. Cosci, highly stable power supply, **552**
—— with E. Flater, electronic multiplier using modulated pulses, **1417**
Franz, W., and K. Deppermann, theory of diffraction by cylinder, taking account of surface wave, **1665**
Frazer, B. C., and R. Pepinsky, X-ray analysis of ferroelectric transition in KH$_2$PO$_4$, **2048**
Freely, J., with others, mechanism of field-dependent secondary emission, **998**
Freeman, J. J., conductance and noise spectrum of electron streams, **1198**; N.B.S. noise comparator for microwaves, **2081**
Freeman, W. H., with others, wide-band coupling unit for power-line carrier equipment, **359**
Freiesleben, H. C., Decca-chart calculations, **2009**
Fremlin, J. H., noise in thermionic valves, **1864**
Fréon, A., and A. Martin, simple mains-frequency pulse generator, **488**
Freudenhammer, K., output-stage harmonic power radiated by transmitter, **2482**
Frey, J., with J. Brackmann, copper eddy-current losses in coils with ferrite cores, **3526**
—— with others, measurements on high-μ ferrite cores, **1032**
Freymann, M., and R. Freymann, method of studying lattice defects in ZnO, **1700**
Freymann, R., R. Rohmer and B. Hagene, lattice defects and Debye r.f. absorption in iron oxides, **2328**, **(C)3612**
—— with M. Freymann, method of studying lattice defects in ZnO, **1700**
Friedland, S. S., and H. S. Katzenstein, factors influencing life of self-quenching counters, **2104**
Friedlander, E., new vector slide rule, **2714**
Friedrichs, K. O., quantum theory of fields, **1289**, **1290**, **2620**
Frigon, A., Radio Canada building in Montreal, **221**
Friis, H. T., with S. A. Schelkunoff, Antennas, Theory and Practice, **(B)637**
Frith, R., with others, humidity of upper troposphere and lower stratosphere over southern England, **1671**
Fritz, K., magnetrons, development in Germany, **2852**, currents and space charge in, **3764**
Fritze, E. H., punched-card-controlled aircraft-navigation computer, **2674**
—— with W. G. Anderson, instrument-approach-system steering computer, **1369**
Fritzsche, C., with others, dependence of low-temperature conductivity of Cu$_2$O on oxygen pressure, **1385**
Fritzsche, H., effect of dissolved oxygen on conductivity of ZnO, **1031**
Friz, W., with W. Klein, characteristics of travelling-wave valve with dispersive delay line, **2826**
Froelich, H. C., ZnS-Cu phosphors with yellow and red emission, **3609**
Fromageot, A., concept of entropy in calculus of probability, **536**; London conference, Sept. 1952, on applications of theory of information, **3702**
Froula, H., direct measurement of images in electron microscope, **2759**
Frühauf, H., matrix calculus and application of 'normalized magnitudes' in electrical engineering, **3639**
Fründt, H. J., multipath distortion on a f.m. u.s.w. beam link, **218**
Fry, D. W., linear electron accelerator, **507**
Fubini, E. G., and F. H. Rockett, Jr, bandwidth of $\lambda/4$ sections, **30**
Fuchs, G., reflections in coaxial cable due to impedance irregularities, **2730**
Fues, E., with W. Bösenberg, barrier layer of Ge plate rectifier with forward current, **2698**
Fujimura, T., with others, permittivity and permeability of ferrites at 6·6-cm λ, **(C)1401**
Fukuhara, S., with H. Miyazawa, electrolytic conduction in Cs$_3$Sb, **2676**
Fukushima, N., characteristics of magnetic storm, 3rd Aug. 1949, **2644**; constitution of polar magnetic storms, **2978**
—— and T. Hayasi, relation between F$_2$-layer disturbance and geomagnetic storminess, **2986**
—— with T. Nagata, constitution of polar magnetic storms, **2977**
Fuller, C. S., and J. A. Ditzenberger, diffusion of Li into Ge and Si, **3616**
—— and J. D. Struthers, Cu as acceptor element in Ge, **119**
Funatogawa, Z., with Y. Gondo, temperature dependence of magnetoresistance of Fe single crystal, **2044**
Furrer, W., and A. Lauber, reverberation-time measurements with warble tones and with white noise, **1571**; 'diffusion' in room acoustics, [illegible]
Furutsu, K., calculation of field strength near antipode of transmitting station, **2779**

G

Gabler, H., G. Gresky and M. Wächtler, accuracy of c.r.o. direction finder, **1367**
Gabor, D., information content of an e.m. signal, **2135**
Gabrysh, A. F., with others, ultrasonic velocity and absorption in air, **7**
Galbraith, R. A., with D. K. Cheng, stagger-tuned multiloop aerials for wide-band l.f. reception, **3207**
Gale, A. J., with E. A. Burrill, electron beams sterilize food, **505**
Gallie, G., G. Dolgikh and V. Yurkov, electrical properties of Sb$_2$S$_3$ and Bi$_2$S$_3$, **3019**
Gallagher, C. J., plastic deformation of Ge and Si, **1403**
Gamble, M., hermetically sealed Mg-CuS rectifiers, **2153**
Gamo, H., Faraday rotation of waves in round waveguide, **2889**
Gans, F., J. Lagrenaudie and P. Seguin, preparation and properties of arsenide semiconductors, **3325**
Gans, R., and M. Bemporad, theory of straight aerial, **2220**
Garbuny, M., theory of reflex resnatron, **1207**
Garin, P., with — Prugne, use of membranes in vacuum technique, **110**
Garratt, G. R. M., and A. H. Mumford, history of television, **848**
Gässler, G., with E. Zwicker, suitability of dynamic headphones for measurements on f.m. tones, **312**
Gaume-Mahn, F., ferromagnetism of Gd-Mg alloys, **127**
Gautier, P., measurement of derivatives of axial field of powerful magnetic lens, **185**
Gauzit, J., temperature and photochemical phenomena in upper atmosphere, **1344**
Gavin, M. R., transit-time oscillations in triodes, **(D)1200**
Gavreau, V., and A. Calaora, absolute calibration of microphones, **3173**
Gayffier, A., with P. Giroud, developments of Decca navigation system, **3313**
Gea Sacasa, R., can prediction be simplified? **1107**; ionospheric propagation, **1773**; predictions of optimum working frequency, **3689**
Gebauer, R., and H. Kosmahl, construction, properties, operation and applications of klystrons, **596**
Geddes, W. K. E., with P. E. Axon, calibration of disk recordings by light-pattern measurements, **2875**
Gee, C. C., electron tubes for industry and research, **587**
van Geel, W. C., with J. W. A. Scholte, impedances of electrolytic rectifier, [illegible]
van Geen, J., vectorial c.r.o. display of sinusoidal voltages, **3372**
Geiger, R. H., with others, microwave determination of electron density and collision frequency in gas discharge, **380**
Geiling, L., matching of thermocouple and galvanometer, **2387**
Geisler, A. H., with D. L. Martin, permanent-magnet properties of Co-Pt alloys, **(D)2709**
Geist, D., and K. Seiler, temperature dependence of backward current in Ge *p-n* junctions, **423**
—— with others, thermally produced lattice defects in Ge, **1897**
Genna, W. N., with W. R. H. Lowry, independent-sideband s.w. receiver, [illegible]
Gens, R. S., with H. L. Rorden, radio noise in relation to design of h.v. transmission lines, **927**
Gent, A. W., transient response of r.f. and i.f. filters to a wave packet, **(A)350**, **963**
Genzel, L., and H. Muser, photoelectric and optical properties of PbS layer, **2677**
George, S. F., with A. H. Schooley, signal/noise characteristics of detectors, **529**
George, T. S., and H. Urkowitz, noise in microwave superregenerative amplifier, **1948**
Gerber, E. A., measuring constants of piezoelectric vibrators, **3670**
Gerhardt, J. R., with C. M. Crain, rapid variations of microwave refractive index of air, **431**
—— with others, measurement of tropospheric index-of-refraction fluctuations and profiles, **1341**
Gerhold, R. A., printed circuits and the automatic factory, **3548**
—— with S. F. Danko, printed circuits for transistors, **674**
Gerjuoy, E., reflection of waves from a point source, **2540**
Gerlach, A. A., test-pulse generator for digital computers, **489**
—— with others, electronic function generator, **451**
Gerlach, W., coercive force and crystal energy, **753**
Germain, P., development of a product integrator, **149**
Gershman, B. N., pulse distortion in ionospheric propagation, **513**
Gerspacher, F., ignitron-type timer for spot-welding machines, **501**
Gerst, I., with A. D. Fialkow, maximum gain of *RC* network, **1606**
Gerstman, L. J., with others, experiments on synthetic speech sounds, **919**
Gertsenshtein, M. E., longitudinal waves in plasma, **1310**
Gevers, M., with others, measurement methods for properties of ferroxcube materials, **3060**
Geyger, W. A., magnetic amplifiers, balance-detector type, **3504**, self-balancing potentiometer type, **3511**
Ghosh, M., increase of F$_1$ and F$_2$ ionization from sunspot minimum to maximum, **1993**
Giacoletto, L. J., parallel tuned circuit periodically switched to d.c. source, **65**; junction-type transistor, equivalent circuits for, **644**, characteristics at l.f. and m.f., **2489**, equipment for measurement of admittance parameters in range 1 kc/s–1 Mc/s, **3359**; linear four-terminal networks including transistors, **2238**
—— and H. Johnson, u.h.f. triode design, **1536**
Giacomini, A., ultrasonic measurements, **1561**
Giambomi, L. A., with S. J. Barnett, new gyromagnetic effect in permalloy and iron, **757**
Gianola, U. F., magnetic lenses with axial field γ/r^n, **189**
Gibbons, J. J., and R. J. Nertney, wave-equation solutions for ionospherically reflected long waves, **(D)410**, **517**
—— and R. L. Schrag, solving wave equation for region of rapidly varying refractive index, **803**
—— R. L. Schrag and A. H. Waynick, long-delay ionospheric echoes at 150 kc/s, **1992**
Gibson, A. F., with R. Lawrance, measurement of drift mobility in semiconductors, **1379**
Gibson, J. W., and C. F. Miller, electric strength of SF$_6$ at r.f., **3627**
Gibson, W. T., thermistor manufacture, **2240**
de Gier, J., and others, steel c.r. tube for television receivers, **3132**
Gieseke, W., with others, measurements on high-μ ferrite cores, **1032**
Gihring, H. E., with others, multiple television and f.m. aerial system, **1589**
Gilbert, M., with others, fundamental aspects of colour television, **1814**
Gilbert, R. W., induction galvanometer as converter, **3666**
Gilford, C. L. S., membrane sound absorbers in broadcasting studios, **924**
—— with T. Somerville, composite c.r.o. displays of acoustic phenomena, **307**
Gillam, C., with others, B.B.C. television transmitting aerials, **934**
Gille, J. C., airborne servomechanism discriminators, **3422**
Gillies, A. W., electrical oscillations, **2264**
Gilling, B. T., flywheel synchronization, **1499**, **3738**
Ginston, E. L., with others, debunching of electron beams constrained by strong magnetic fields, **3459**
Gipps, G. de V., with others, ionosphere measurements at oblique incidence over eastern Australia, **807**
Giroud, P., and A. Gayffier, developments of Decca navigation system, **3313**
Giulianelli, R. M., with M. J. Kirby, stability of varying-element servo mechanisms, **1723**
Giustini, S., approximate formulae for gain of directive aerial, **635**
Glauberman, A. E., and A. F. Lubchenko, dielectric properties of BaTiO$_3$, **3011**
Gledhill, G. A., with P. E. Ackland-Snow, 6-waveform generator and display unit for testing television channel, **1087**
Glinz, C., field-strength fluctuations of Swiss broadcasting stations, **2424**
Gluck, S. E., EDVAC, **2060**
Gobrecht, H., and F. Speer, measurement of secondary emission, **3581**
Godoli, G., with G. Righini, solar influence in gyro-interaction experiments, **3693**
Gohar, M. K., with A. E. S. Mostafa, determination of parameters of single-layer coils, **1922**
Golay, M. J. E., correlation *v.* linear transforms, **1477**, **(D)3701**
Goldberg, C., acceptors produced in Ge by quenching, **1407**
Goldberg, E. A., high-accuracy time-division multipliers for analogue computers, **151**
Goldberg, J. L., with others, u.h.f. cable measurement equipment, **2393**
Golden, N., and R. Nielsen, c.r.o. for display of static characteristics of transistors, **784**
Golden, R. K., with A. Baños, Jr, e.m. field of rotating magnetized sphere, **1334**
Goldsmith, P., with E. A. Roberts, piezoelectric crystals for pressure, temperature and humidity measurements, **2403**
Goldstein, A., h.f. dielectric heating, **1453**
Goldstein, L., and M. A. Lampert, new linear passive nonreciprocal microwave circuit component, **1265**, **3232**
—— J. M. Anderson and G. L. Clark, interaction of microwaves in gas-discharge plasma, **2637**, **2970**
—— M. A. Lampert and R. H. Geiger, microwave determination of electron density and collision frequency in gas discharge, **380**
Gondesen, K. E., conference on magnetic sound recording, **1577**
Gondet, H., rotating-iron magnetometer, **1730**
Gondo, Y., and Z. Funatogawa, temperature dependence of magnetoresistance of Fe single crystal, **2044**
Good, E. F., *RC*- or direct-coupled power stage, **1286**
Goodall, C. W., and R. C. Looser, measurement of phase delay in television transmission circuits, **1750**
Goodell, C. E., ultrasonic recorder for torpedo depth, **1447**, **2401**
Goodell, J. D., and ?. Rode, multistable magnetic digit storage devices, **449**
Goodfriend, L. S., bypass and decoupling circuits in audio design, **2614**
Gorbacheva, N. A., with others, thermo-luminescence of sulphate base materials, **3906**
Gordon, D. S., vibration measurements, **(D)2400**
Gordon-Smith, A. C., 600-Mc/s field-strength meter, **156**
Gordy, W., with W. C. King, spectroscopy at 1–2-mm λ, **3623**
—— with others, line breadths of the microwave spectrum of O$_2$, **91**

Goret, R., standardization and telecommunications, **2526**
Gorodetski, P. G., transient phenomena in oscillatory circuit with variable inductance, **3551**
Gorter, E. W., with others, preferred crystal orientation in ferromagnetic ceramics, **1036**
Gossard, E. E., with L. J. Anderson, field-strength prediction for nocturnal lines, **1552**
Gossiau, K., precision frequency measurements, **1068**
Gottlich, H., and H. J. Franz, new I.K.A. cables, **617**
Götze, W., tunable *RC* network with one variable element, **958**
Goubau, G., with C. E. Sharp, u.h.f. surface-wave transmission line, **930**
Goucher, F. S., and M. B. Prince, current amplification factor for *p-n*-junction transistors, **2488**
Goulding, F. S., voltage stabilizer with cold-cathode triode, **554**
Goundry, R. A., with W. K. Squires, constant-input-impedance second detector for television receivers, **254**
Gourceaux, M., and A. Colombani, currents induced in wide conductor by narrow conductor carrying h.f., **81**
—— with A. Colombani, h.f. resistance of conducting strip parallel to conducting plane, **80**
Gouriet, G. G., spectrum equalization, **1936**
—— with E. C. Cherry, compression of television signals by recoding, **1154**
Gozzini, A., dielectric constants of gases at cm λ, **1067**
Grace, A. C., and J. A. Lane, direct-reading standing-wave indicator, **3066**
Grachev, A. A., space correlation of noise of magnetic reversals, **3029**
Graf, L., H. R. Lacour and K. Seiler, plastic deformability of Ge, **2033**
Graffunder, W., with H. Briner, geometrical transformation of impedance diagrams, **2576**, **(C)3494**, **2907**
Graham, R., Jr, with A. A. Meyerhoff, fixed-length transmission lines as circuit elements, **1272**
Graham, R. S., with J. W. Ricke, television terminals for L3 coaxial-cable system, **3424**
Granier, J., electrical properties of rubber, **2055**
Granovski, V. L., theory of plasma with variable current, **386**
Granville, J. W., and W. Bardsley, properties of Si point-contact transistors, **2322**
—— and H. K. Henisch, large-area contacts on Ge, **118**
—— H. K. Henisch and P. M. Tipple, contact properties of *p*-type Ge, **117**
Gratama, S., noise in receivers and amplifiers, **815**
Grattidge, W., and H. John, electronic properties of BaS, **893**
Gray, D. J., V. P. Gurske and W. E. Morrow, wide-band data transmitter, **3559**
Grayson, H., with others, circuit technique for f.m. microwave links, **220**
Graziadei, H., frequency-independent transition between coaxial cable and balanced line, **3478**
Greefkes, J. A., with others, delta modulation, **543**
Green, E., television modulation, **(D)1163**; exact amplitude/frequency characteristics of ladder networks, **1267**
Green, M. W., with others, two new photomultipliers for scintillation counting, **266**
Greenberg, H., and D. R. [illegible], ground-reflection phase-error characteristics of vertical aerial, **2221**
Greenblatt, M. H., and others, two new photomultipliers for scintillation counting, **266**
Greene, F. M., influence of ground in v.h.f. field-strength measurements, **2389**
Greenhalgh, J., single-valve line timebase, **2814**
Greenhow, J. S., with T. R. Kaiser, decay of radio echoes from meteor trails, **1978**
Greenwald, C., with others, counter-circuit multiplex receiver, **3099**
Greenwald, S., antiferromagnetic structure deformations in CoO and MnTe, **3035**
Greenwood, N. N., with J. S. Anderson, semiconducting properties of Cu_2O, **1701**
Gresky, G., with others, accuracy of c.r.o. direction finder, **1367**
Gressmann, R., and K. H. Kaltbeitzer, determination of service area for planning u.s.w. networks, **213**
Grieg, D. D., and H. F. Engelmann, microstrip for kMc/s range, **621**, **2212**
Griffin, J. P., high-stability 100-kc/s crystal frequency standards, **1083**
Griffing, G., with D. R. Bates, scale-height determinations and aurorae, **3309**
Griffith, G. W. S., measurement of nonlinearity in television links, **1064**
Griffiths, E., portable p.a., **1899**
Griffiths, H. D., waveguide arrays with symmetrical conductance functions, **2903**
Grifone, L., omnidirectional reflectors for microwaves, **1684**
Grillini, L., experiment with microwave diffraction grating, **1246**
Grillot, E., and P. Guintini, infrared photoluminescence of CdS-Cu, **2012**
Grim, W. M., and A. B. Van Rennes, effects of grid/cathode capacitance in pulse-height selectors, **941**
Grimsdell, G., characteristics of miniature voltage-regulator discharge tubes, **(D)267**
Griswold, W. R., with E. J. Isbister, harbour radar at Boston, Long Beach, New York and Liverpool, **1685**
Groendijk, H., with others, Type E80T valve, synchronization of v.f.o. with, **2816**, multichannel I.G.O. circuits using, **2817**; rubber-membrane model for electron paths, **3756**
Groll, H., power measurement with thermistors at h.f., **1441**
Gross, B., linear networks, **2245**
Grosser, H., with J. W. Cohen, calculation of leakage flux of pendent-armature relays, **387**
Grosskopf, H., input resistance of capacitor microphone, **(D)16**; methods of directional sound reception, **1574**
Grosskopf, J., determination of transmitter service area under conditions of interference, **214**; reflectometer for measurements in s.w. range, **477**
Grossman, A. J., with others, L3 coaxial-cable carrier system, **3409**
Groves, W. E., transmission of e.m. waves through pair of parallel-wire grids, **3590**
Gruen, W. J., theory of a.f.c. synchronization, **3214**, **(C) 3524**
Gruenberg, H., second-order beams of slotted-waveguide arrays, **1914**
Grümm, H., spreading of focused electron beam due to electron charge, **2962**
Grützmacher, M., Physikalisch-Technische Bundesanstalt, Brunswick, **2**
Guanella, G., F. Jenny and P. Waldvogel, Swiss developments in h.f. technology, **1548**
Gubanov, A. I., theory of contact, between metal and semiconductor, **379**, between two semiconductors, **2687**; solid rectifiers, theory of, **2038**, dynamical theory of, **3630**, **3631**
te Gude, H., triple-diode triode Type-E/U/PABC 80, **1191**
Guénard, P., and H. Huber, interaction of space-charge waves in crossed magnetic and electric fields, **1526**
—— with others, amplification by space-charge waves, **278**, oscillations in whole-anode magnetron related to, **904**
Guertler, R., folded dipoles with two or more elements, **1234**
von Gugelberg, H. L., cold-cathode valves, **2501**
Guggenheim, E. A., electron spin in semiconductors, **1960**
Guillon, H., ensuring stability and equality of channel widths in pulse-amplitude analyser, **2230**
Guintini, P., with E. Grillot, infrared photoluminescence of CdS-Cu, **2012**
Guittard, J., analysis of air vibrations in pipes with discontinuities, **588**, **2193**
Gundert, E., trapezoidal distortion in c.r.o. tubes, **2742**
Gungle, W. C., with others, electroluminescence, **2956**
Gunn, J. B., resistance of Ge contacts, **1030**; radiative transitions in Ge, **2331**
Gunn, W. F., e.m. surface waves, **620**
Gunn-Russell, C., with R. W. Leslie, remote control and automatic monitoring of Third Programme transmitter, **261**
—— with others, B.B.C. monitoring technique for unattended transmitters, **548**
Günther, G., coaxial cables with disk insulators at frequencies > 1 kMc/s, **3183**
Günther, J., synchronization technique in television, **1153**, **(C)2161**
Guptill, E. W., sound field, near circular transducer, **918**, of piston source, **1878**
Gurevich, S. B., and V. G. Panchenko, ferroelectric materials, **1373**
Gurske, V. P., with others, wide-band data transmitter, **3559**
Gutbier, H., with H. Neuert, counter tubes with Ar and methylene-halide fillings, **1461**
Gutterman, A., with B. J. O'Neill, equipment for transistor testing, **3052**
Guy, R. F., with others, multiple television and f.m. aerial system, **1589**

H

Haacke, W., stability criterion for *n*-mesh varying-parameter networks, **1271**
de Haan, E. F., with J. G. van Wijngaarden, l.f. noise in electrometer valves, **1185**
Haantjes, J., with others, effects due to curvature of valve characteristics, **1854**; new trends in a.m./f.m. receiver design, **2427**
Haas, G., direct-voltage amplifier with crystal contact breaker, **2395**
Haase, K. H., filters, fundamentals of theory and technique, **665**, coupling-free, systematic design procedure for, **1612**
Hadley, C. P., thermionic emission from oxide-coated W filaments, **1857**
Hadley, D. T., with others, aerial-radiation-pattern analogue computer, **3198**
Hadley, L. N., with K. K. Curtis, acoustical interference filters, **912**
Haeff, A. V., with others, resistive-wall amplifier valve, **3147**
Haeany, C., with R. Favre, construction of Maze-type counters, **2106**
Hafner, E., e.m. oscillations, of a biaxial anisotropic parallelepiped, **1315**, of a uniaxially anisotropic cavity resonator, **1628**; dielectric constant of uniaxial crystals, **2392**
—— with F. Reder, method of determining dielectric constants of fluids at cm λ, **1734**
Hagedorn, R., statistical model of $BaTiO_3$ single crystal, **1043**
Haken, C., with others, variation of partial processes in magnetostriction, **130**
Hagen, J. P., and N. Hepburn, solar outbursts at 8·5-mm λ, **93**
Hagenberg, T., with others, steel c.r. tube for television receivers, **3132**
Hagene, B., with others, lattice defects and Debye r.f. absorption in iron ferrite, **2328**, **(C) 3612**
Hagenhaus, K., rectifier-type voltmeter and distortion meter without valves, **167**
Hahn, M., with F. Lenz, asymmetry of magnetic electron lenses, **2098**
Hahnel, A., multichannel crystal control of oscillators, **975**
Halacsy, A. A., calculation of magnetizing force, **3587**
Halbach, K., design of linear networks with optimum signal/noise ratios, **1927**
Halford, G. J., wide-band waveguide phase-shifter, **2567**
Hall, C. M., variable equalizer for broadcast-programme circuits on trunk lines, **820**
Hall, E. L., world wide reception of standard-frequency broadcasts, **522**
Hall, G. L., with others, positive and negative ions in c.r. tubes, **2846**
Hall, G. N., with C. L. Rouault, h.v. medium-power *p-n*-junction rectifier **835**
Hall, H. H., with others, reverberation-room measurements of loudspeaker efficiency, **2873**
Hall, J. S., distant field of nonresonant sloping-V aerial, **3205**
Hall, R. N., *p-n* junctions produced by growth-rate variation, **743**; power rectifiers and transistors, **834**
Hallows, R. W., reactivation of dry cells, **3117**
Halpern, L., and K. M. Koch, Corbino effect and magnetic variation of resistance in Bi, **1710**
Halsey, R. J., and H. Williams, Birmingham/Manchester/Holme-Moss television cable system, **1147**
Halter, J. B., with J. G. Woodward, lateral mechanical impedance of gramophone pickups, **3181**
Hamaker, H. C., theory of sequential sampling for attributes, **2715**
Hamer, E. G., v.h.f. radio, **547**; v.h.f. radio noise, **817**; noise performance of v.h.f. receivers, **1789**; v.h.f. aerial radiation measurements, **3156**
—— and D. W. Elson, a.f. combining system for space-diversity receivers, **2426**
Hamilton, G. E., and R. Towne, grey-scale generator, **585**
Hammett, M. G., and H. W. Finch, β-particle and γ-ray thickness gauges, **498**
Hamming, R. W., with R. M. Bozorth, magnetostriction constants of single crystals, **2045**
Hammond, P., power gain of aerial arrays, **1909**
Hammond, P. H., with F. J. U. Ritson, electronic simulator for hydraulic servomechanism, **1054**
Hampe, W., with M. L. Exner, determination of damping of pulsating air bubbles in water, **2584**
Hampikian, A., analogue computer for magnetic electron lenses, **2722**
Hancock, E. J., photoformer design and performance, **452**
Händler, W., and J. Peters, calculation of transients in carrier-current systems, **2246**
Hanle, W., and K. H. Rau, light emission and destruction of phosphors by electron and ion impact, **734**
Hannahs, W. H., and J. W. Eng, production control of printed resistors, **47**
—— and N. Stein, printed unit assemblies for television, **352**
Hansen, G., transmitting equipment at Wavre-Overijse broadcasting centre, **1128**
Hansen, J. E., a.f. impedance and phase-angle meter, **2741**
Hansford, R. F., and G. J. Dixon, remote display of radar pictures, **2005**
Harang, L., and B. Landmark, 35- and 74-Mc/s pulse echoes observed during aurorae and geomagnetic storms, **2976**
Hardeman, G. E. G., with N. J. Poulis, temperature dependence of spontaneous magnetization of antiferromagnetic single crystal, **3336**
Harden, B. N., diffraction of e.m. waves by half-plane, **88**
Harder, E. L., power control with magnetic amplifiers, **176**
Hardie, A. M., mechanical synthesis of a.m. wave, **469**; equivalent cathode diameter for squirrel-cage filament structures, **3153**
Harding, K. C., with C. R. Knight, specifications for reliable valves, **270**
Hardy, H. C., H. H. Hall and L. G. Ramer, reverberation-room measurements of loudspeaker efficiency, **2873**
Harley, H. V., valve matching using resistors, **3563**
Harmuth, H., gas-filled counter and switching valves, **296**
Harnischmacher, E., improvements to Berkner-Wells-Seaton-type ionosphere sounder, **725**
—— and K. Rawer, radio links covering very great distances, **520**
Harrington, R. F., field of current element near edge of conducting half-plane, **2967**
Harris, E. F., helical beam aerial, for citizens' radio, **1593**, performance of, **3489**; u.h.f. mobile aerial array, **2222**; experimental investigation of corner reflector aerial, **2224**
Harris, H., Jr, M. J. Kirby and E. F. von Arx, servomechanism transient performance from db/log-*f* plots, **3721**
Harris, H. C., a.m.-f.m. analogy, **3246**
Harris, I. A., transit-time oscillations in triodes, **(D)1200**
Harris, J. N., precision 1-MΩ h.v. ratio box, **474**
Harris, J. R., transistor shift register and serial adder, **767**
Harsh, M. D., with others, improved 'graphechon' storage tube, **1539**, **2845**
Hart, R. C., life testing of c.r. tubes, **1444**
't Hart, L., and C. Strasser, modern transmitting equipment for merchant ships, **2818**
Hartel, W., electronic voltage stabilizer, **1864**
Hartmann, W., properties of capacitors at h.f., **2244**
Hartsfield, W. L., and R. Silberstein, comparison of c.w. field intensity and back scatter delay, **806**
Hartshorn, L., units and standards of electrical measurement, **1059**
Hartwright, J. F., operation of television outside-broadcast units, **1144**
Harvey, A. F., instruments for microwave measurements, **(D)3362**
Harvey, P. J., television booster stations, **1811**
Hasegawa, M., and H. Maeda, conductivity of upper atmosphere deduced from variations of geomagnetic field, **2647**
Haselbeck, W., measurement-instrument error, **1074**
Hastings, A. E., methods of obtaining frequency spectra, **160**
—— and J. E. Meade, device for computing correlation functions, **161**
Hastings, J. M., with others, neutron diffraction study of Mg ferrite, **3335**
Hatanaka, T., and F. Moriyama, characteristics of noise storms, **2971**
Hatfield, P., with R. G. Patton, ultrasonic applications in rubber industry, **493**
Hathaway, J. C., with M. L. Doelz, electromechanical i.f. filters, **1615**
Hatta, T., with Y. Nomura, theory of linear aerial, **3201**
Hausman, H. J., with others, r.f. power supply, **1134**
Hausner, H. H., world congress on powder metallurgy, **1412**
Haven, Y., and J. H. van Santen, pre-exponential factors in formulae for ionic conductivity in solids, **3578**
Hawkins, G. S., and M. Almond, radar observations of major night-time meteor streams, **108**
Hawthorn, A. N., and S. W. Messent, laminated plastic insulating materials, **2353**
Hay, H. G., and R. S. Unwin, tropospheric wave propagation in duct of nonuniform height, **1471**
Hayashi, C., forced oscillations with nonlinear restoring force, **1940**; nonlinear periodic oscillations, stability investigation of, **2361**, subharmonic oscillations in, **2953**
Hayashi, T., with N. Fukushima, relation between F_2-layer disturbance and geomagnetic [illegible], **2986**
Haydon, S. C., with others, time lags in electrical breakdown of gases, **3262**
Hayes, E. W., B.B.C. mobile television transmitter, **3127**
Hayes, J. E., television facilities of the Canadian B.C., **1170**
Hayes, M. E., with others, phosphor [illegible], **1103**
Haynes, H. E., new principle for [illegible], **965**
Haynes, J. R., and J. A. Hornbeck, [illegible], **2691**
Hazard, C., with R. H. Brown, r.f. [illegible] supernova A.D. 1572, **95**
Head, J. W., decomposition of functions, **763**; effect of wall shape on decay [illegible], **2872**
Heaps, S. N., with others, instrumentation for geophysical exploration, **2749**
Heavens, O. S., contamination of evaporated Ag and Ge films by heater material, **758**
Heber, G., quantum theory of ferromagnetism, **2340**; structure of ferromagnetic state in α-Fe and some Fe alloys, **3027**
Heddle, T. A., temperature sensitivity of special magnetic materials, **3338**
Heiland, G., and G. Rupprecht, logarithmic-scale valve galvanometer, **3363**
Heim, T., electrical microdynamometer, **490**
Heller, D. M., choice of channel spacing in mobile-communication bands, **3714**
Hellerman, H., and C. R. Cahn, linear detection of a.m. signals, **208**
Hellgren, G., propagation of e.m. waves along conical helix, **1973**
—— and J. Meos, location of aurorae with 10-m radar equipment, **728**
Helliwell, R. A., graphical solution of sky-wave problems, **1469**
Hellstrand, E., with others, synchronization of pulsed high-energy ion beams, **1448**
Helwig, G., conductivity and structure of sputtered CdO layers, **133**
Henderson, C., F. F. Heymann and R. E. Jennings, phase stability of electron cyclotron (microtron), **2090**
Henisch, H. K., with J. W. Granville, large-area contacts on Ge, **118**
—— with others, contact properties of *p*-type Ge, **117**
Henniger, H., eddy-current losses in ferromagnetic materials with complex conductivity, **1400**
Henning, R. E., with A. L. Witten, wide-band waveguide recording reflectometer, **463**
Henry, E. C., with J. R. Hensler, resistance of refractory oxides at 600–1500° C., **2684**
Henschke, R. A., matrix analysis of transmission through multilayer dielectric wall, **1663**
Hensler, J. R., and E. C. Henry, resistance of refractory oxides at 600–1500° C., **2684**
Hensley, E. B., electrical properties of porous semiconductors, **737**
Hepburn, F., and E. T. Pierce, atmospherics with very-low-frequency components, **2771**
Hepburn, N., with J. P. Hagen, solar outbursts at 8·5-mm λ, **93**
Hepp, G., battery-operated G-M counter, **3682**
Herbert, R. J. T., discrimination against noise in scintillation counters, **191**
Herbstreit, J. W., signal-generator method for measurement of low signal levels, **1061**
—— with others, ground-to-air cochannel interference at 2·9 kMc/s, **1798**; v.h.f. transmission over mountainous paths, **3396**
Hercock, R. J., and D. M. Neale, exposure timers compensated for supply-voltage variations, **789**
Hergenrother, R. C., and A. S. Luftman, improved single-gun storage c.r. tube, **1868**
—— and H. G. Rudenberg, direct-reading oscilloscope for 100-kV pulses, **3587**
Heritage, R. J., and J. R. Balmer, metallizing glass, ceramic and plastic surfaces, **2346**
Herman, E. B., with others, analysis of microwave-aerial side-lobes, **41**, **(C) 2226**
Herman, F., and J. Callaway, structure of Ge crystal, **1699**
Hermann, R., bibliography on metre waves in mobile services, **3407**
Herpin, A., with C. Dufour, propagation of e.m. waves in transparent periodically stratified medium, **3589**
Herreng, P., G. Couanault and G. Plottin, 3 signal generators covering range 20–1200 Mc/s, **1084**
Herrick, J. F., and F. H. Krusen, physiological effects of microwaves, **2748**
Hersperger, S. P., with W. J. Kessler, recent developments in radio location of thunderstorms, **1020**
Hersping, A., measurement of constants of ferrites with slotted coaxial line, **1742**
Hertel, P., Jr, A. W. Straiton and C. W. Tolbert, dielectric-constant measurements at λ 8·6 mm, **3655**
Hertwig, H., automatic tuning control of h.f. generators with varying load, **681**
Hertz, C. H., ferromagnetic scaling circuit, **1255**
Herwelly, A., luminescence of phosphors in electric field, **1644**
Herzog, G. B., with others, [illegible] transistor curves, **1437**; transistor circuits for television, **2813**
Herzog, W., transistor oscillator, **678**, circuits, **1287**; methods of improving frequency stability of oscillators, **1513**
Heuser, H., organization and installations of Lüchow radio station, **2444**
Heusinger, P. P., measurement of temperature dependence of velocity of sound in liquids, **1224**
Hewel, H., problems of television pickup technique, **1165**
Hewish, A., investigation of ionospheric irregularities by observation of diffraction pattern of galactic r.f. waves, **722**
Hewitt, W. H., with others, modulators and gyrators using Hall effect in Ge, **1930**
Heymann, F. F., with others, phase stability of electron cyclotron (microtron), **2090**
Heyn, F. A., and J. J. Burgerjon, synchrocyclotron at Amsterdam, **3076**
Heywang, W., stray capacitance with high-μ dielectrics, **3217**
Hibbard, L. U., and D. E. Caro, instantaneous measurement of rapidly varying frequency, **1428**
—— with D. E. Caro, wide-range oscillator of high stability, **1628**
Hibberd, F. H., transient effects in thermionic filaments, **282**
Hibi, T., and K. Ishikawa, spectral dependence of thermionic emission from (Ba-Sr)O cathodes, **284**
Hiedemann, E., and R. D. Spence, coherent theory of relaxation phenomena, **694**
Higgins, T. J., and D. K. Reitan, capacitance calculation for circular annulus by subarea method, **2302**
—— with J. van Bladel, e.m.-wave propagation in layered-dielectric waveguides, **321**
—— with W. B. Swift, e.m. propagation in waveguides of rhombic cross-section, **2883**
Hilgenberg, O. C., meaning and purpose of U.D.C. system, **2520**
Hill, A. V., Brownian fluctuations of coupled galvanometer system, **2077**
—— with others, moving-coil galvanometer of extreme sensitivity, **2076**
Hill, R. D., Jr, with B. G. Bromber, reliability of airborne electronic components, **1939**
Hill, S., speech-input systems for broadcasting transmitters, **894**
Hillier, G. H., clavioline, **318**
Hinchliffe, J. D. S., with others, factors affecting performance of coaxial cables for television links, **928**; u.h.f. cable measurement equipment, **2393**
Hindman, J. V., with W. N. Christiansen, 1·42-kMc/s emission from galactic hydrogen, **718**
Hines, C. O., higher-order approximations in ionospheric wave propagation, **2108**; generalized magneto-hydrodynamic formulae, **2636**; wave hypothesis of moving irregularities in ionosphere, **2655**; reflection of waves from varying media, **2765**
Hines, H. M., and J. E. Randall, possible dangers in industrial use of microwave radiation, **1093**
Hinton, W. R., measurement of 'A'-matrix elements of passive networks, **1605**, **(D) 3227**
von Hippel, A., piezoelectricity, ferroelectricity, and crystal structure, **699**
Hirashima, M., motion of electrons in retarding-field valves, **3157**
Hirone, T., and others, d.c. magnetization characteristics of [illegible], **2703**
Hitchcox, G., electronic instrumentation for *p*H measurement, **3683**
Hitschfeld, W., with others, scattering and attenuation by nonspherical atmospheric particles, **2314**
Hobart, T. D., U.S. Navy 1-MW v.l.f. transmitter, **821**
Hoerter, G., telecommunications in civil aviation, **3419**
Hoffmann, B., energy momentum tensor in Dirac's new electrodynamics, **1298**
van Holweeken, J. M., R.T. equipment for Eindhoven-Tilburg link, **546**
Hogan, J. T., [illegible], **854**
Hogarth, C. A., transistor action in PbTe, **1409**, in PbS, **2036**

Hogg, D. C., e.m. field in circular aperture due to spherical waves, **1667**
Höhler, G., Dirac's new theory of electrons, **990**
Hok, G., statistical approach to space-charge distribution in cut-off magnetron, **592**; waveguide-loaded resonator for interdigital magnetron, **2848**
—— N. W. Spencer and W. G. Dow, dynamic probe measurements in ionosphere, **3291**
Holbrook, J. G., null characteristics of rotating Adcock system, **2906**
Holland, E. O., with A. J. Biggs, British television receiver, **1495**
Holle, W., and G. Latzel, reciprocity calibration of capacitor microphones, **2544**
Hollinghurst, F., and D. S. Tod, specification and testing of television wire-broadcasting systems, **1755**
Hollis, J. L., avoiding grid current in class-B modulators, **3249**
Hollmann, H. E., nonlinear h.f. and l.f. circuit elements, **645**; transistor circuits and theory, **3520**; frequency feedback, **3549**
Hollway, D. L., optimum space-charge-controlled focus of electron beam, **901**; decimal counter tube, **2515**
—— and G. J. A. Cassidy, equipment for dielectric measurements at 100–300 Mc/s, **481**
Holman, F. S., with O. G. Villard, Jr, electrically tuned *RC* oscillator or amplifier, **1638**
Holman, H. E., and W. P. Lucas, continuous-motion system for televising motion-picture films, **851**
Holmes, D. K., energy levels in Si, **421**
Holt, R. B., with others, measurement of small-signal parameters of transistors, **3358**
Holton, P., and J. Sharpe, corona-stabilized h.v. supply for proportional counters, **1803**
Hölzler, E., and H. Holzwarth, 24-channel p.p.m. beam R/T system, **822**
Holzwarth, H., comparison of modulation methods for directional radio links, **2791**
—— and W. Arens, modulation equipment for 24-channel p.p.m. beam R/T system, **822**
—— with E. Hölzler, 24-channel p.p.m. beam R/T system, **822**
Hönl, H., and A. W. Maue, uniqueness of solutions in rigorous theory of diffraction, **373**
—— and E. Zimmer, intensity and polarization of e.m. waves diffracted at slit, **3269**
Honnell, P. M., transmission matrix stability criterion, **2231**
—— and R. E. Horn, resonance characteristics by conformal mapping, **53**
Honoré, É., and É. Torcheux, Rana radio-navigation system, **3314**
Hopf, D., and H. Bock, circuit technique of new valves for a.m./f.m. receivers, **204**
Hopkin, A. M., phase-plane analysis of saturating servomechanisms, **2447**
Hopkins, F., with others, synthesis of 3-terminal *RC* networks, **656**
Hopkins, H. G., direction finders, **(D)2008**
Hopkins, H. H., 5 : 1 zoom lens for television, **849**
Hopkins, R. U. F., with others, propagation phenomena on microwave line-of-sight links, **1785**
Horiuchi, K., surface-wave propagation over curved conductor, **3473**
—— with M. Namiki, transient phenomena in waveguide, **2216**
Horn, R. E., with P. M. Honnell, resonance characteristics by conformal mapping, **53**
Hornbeck, J. A., with J. R. Haynes, temporary traps in Si and Ge, **2691**
Hornbostel, W. G., with M. C. Eliason, acoustic firing-error indicator, **192**
Horner, F., effect of buried cables on accuracy of d.f. bearings, **2997**
Hornfeck, A. J., and G. R. Markow, multiplex telemetry system using teletype transmission, **1097**
Horstman, C. C., improvements in core materials for small transformers, **[illegible]1**
Horton, C. E., u.h.f. grounded-grid amplifier, **1205**
Horton, C. W., diffraction of plane sound wave by paraboloid of revolution, **3169**
Horton, W. F., magnetic amplifiers for industry, **945**
—— with J. T. Carleton, figure of merit of magnetic amplifiers, **(A)2580, 2912**
Hosler, W. R., with R. G. Breckenridge, TiO_2 rectifiers, **229**
Hough, J. M., with others, dielectric constant of water films, **1040**
Houldin, J. E., impedance-measurement equipment for range 50–500 Mc/s, **478**
—— and G. T. Thompson, h.f. bridge with variable ratio arms, **1438**
Howard, L. N., and J. S. Smart, specific heat discontinuity in antiferromagnets and ferrites, **3623**
Howard, R. C., C. J. Savant and R. S. Neiswander, linear-to-logarithmic voltage converter, **3042**
Howard-Flanders, P., focusing system for linear particle-accelerator, **1099**
Howe, J. P., properties of graphite, **1411**
Howerton, H. K., with others, portable 250-kV accelerators, **3679**
Howes, J. W., characteristics and applications of thermistors, **3215**
Howitt, G., evaluating a.f.c. systems for television receivers, **570**
Hoyaux, M., with others, electronic tachometer, **2747**
Hsu, H., transformations of linear active networks, **956**
Hubbard, J. C., with others, ultrasonic velocity and absorption in air, **7**
Hubbard, W. M., with others, permanent magnet from powdered MnBi, **1035**
Huber, H., with P. Guénard, interaction of space-charge waves in crossed magnetic and electric fields, **1526**
—— with others, amplification by space-charge waves, **278**, oscillations in whole-anode magnetron related to, **904**
Hubl, F., frequency-meter for very low frequencies, **3375**
Hübner, R., thyratron as switching and control valve, **902**
Hübner, W., bridge circuit for feeding several loads, **1491**
Hudson, C. S., with A. G. Milnes, 400-c/s and 1·6-kc/s transductors, **3216**
Hudson, R. F., with D. R. Scott, analogue computer for mine-ventilation networks, **3349**
Hufford, G. A., wave propagation through inhomogeneous medium, **2415**
Hugenholtz, E. H., impulse-governed oscillator, a system for frequency stabilization, **2607**
Huggins, P., changing the phase of a sinusoidal l.f. voltage, **330**; electronics in resistance welding, **502**; combined timer and cycle counter, **770**
Huggins, W. H., phase principle for complex-frequency analysis, **918**
Hughes, R. C., and P. P. Coppola, electrical conductivity of oxide emitters, **894**; bariated tungsten emitters, **1189**
Hughes, W. L., locked-oscillator frequency dividers, using nonlinear elements, **1281**, using thyrite elements, **3560**
Hull, J. F., G. Novick and B. D. Kumpfer, high-power delay line for travelling-wave amplifier or oscillator, **2828**
Hulls, L. R., and K. A. Mackenzie, electronic h.v. insulation tester, **480**
Hum, D. M., with others, electronic band structure of PbS, **2037**
Humbel, F., F. Jona and P. Scherrer, anisotropy of dielectric constant of ice, **2027**
Humphrey, J. N., F. L. Lummis and W. W. Scanlon, capacitance effects in thin conductive films, **2682**
Hung, C. S., with R. M. Baum, activation energy of heat-treatment-induced lattice defects in Ge, **742**
Hunsinger, W., electrical measurement equipment at 1952 Technical Fair, Hanover, **166**
Hunt, G. A., with A. R. A. Rendall, transmitter combining circuits, **870**
Hunt, G. J., and E. W. Elliott, sine-squared pulse, **3377**
—— and L. G. Kemp, group-delay-distortion measuring equipment, **1076**
—— with others, equipment for impedance matching and measurement at v.h.f., **1747**
Hunt, K. L., collective electron ferromagnetism, **1968**
Hunter, L. P., and H. Fleisher, graphical analysis of transistor switching circuits, **653**
Hupert, J. J., evaluation of f.m. distortion in tuned interstages, **3550**
—— A. Przedpelski and K. Ringer, double-counter discriminator, **684**
Hurlburt, E. H., with R. C. Ellenwood, determination of impedance with double-slug transformer, **774**
Hurrle, K., e.m. horns with phase-correcting lenses, **1242**; excitation and radiation of microwave lenses, **3486**
Husson, R., conditions relating to aesthetics of music, **1882**
Hutchinson, G. W., possible relation of galactic radio noise to cosmic rays, **37**
Hutter, R. G. E., space-charge-wave valves, **1856**
Hylas, A. E., and W. V. Tyminski, u.h.f. grid-dip meter, **2080**
—— with W. V. Tyminski, wide-band hybrid ring for u.h.f., **960**

I

Ichijo, B., measuring dielectric constant and loss angles of semiconductors, **[illegible]**
Iglitsyn, M. I., electrical properties of multicrystal Se, **2690**
Ignat'eva, L. A., and S. T. Kalashnikov, resistance of metals at high current density, **1377**
Ikeda, K., with others, a.c. magnetization characteristics of a perminvar wire, **2703**
Ikegawa, T., and J. Okada, resistivity of artificial graphite, **1041**
Ikeno, Nobuiti, with others, networks with maximally flat delay, **(D)2259**
Ilowite, R., with G. E. Hamilton, grey-scale generator, **565**
Ince, C. R. S., atomic clocks and frequency stabilization, **(D)1422**
Induni, G., modern h.v. oscillographs with cold cathode, **2743**
Ingård, U., influence of meteorological conditions on sound propagation, **2538**
Ingle, D. P., with others, c.r. tubes with internal pole pieces, **257**
Inn, E. C. Y., with others, formation of D layer, **2652**
Inuishi, Y., temperature dependence of contact noise, **2952**
Ireland, J. R., magnetostriction in alnico-5, **2344**
Isakovich, M. A., scattering of waves by irregular surface, **2969**
Isbell, D. E., with others, microwave measurements on metal powders suspended in wax, **2326**
Isberg, P., with N. Forsberg, 1-MV van de Graaff generator for ion accelerator, **184**
Isbister, E. J., and W. R. Griswold, harbour radar installations at Boston, Long Beach, New York and Liverpool, **1685**
Ishikawa, K., with T. Hibi, spectral dependence of thermionic emission from (Ba-Sr)O cathodes, **284**
Iskraut, R. W., angular momentum in Dirac's new electrodynamics, **1297**
Israël, H., height of atmospheric electric-equilibrium layer, **1343**
—— and H. W. Kasemir, studies of atmospheric potential gradient, **1355**
Isted, G. A., multiple bursts of signal in long-distance v.h.f. propagation, **2410**
Ito, R., end effects in G-M counters, **2411**
van Itterbeek, A., with others, influence of magnetic field on resistance of Fe films, **1039**
Ives, R. L., recorder keep-alive circuit, **473**
Ivey, H. F., effect of V_f on I_a of diode, **1194**; space-charge-limited currents between inclined plane electrodes, **2509**
Iwata, T., with others, a.c. magnetization characteristics of a perminvar wire, **2703**

J

Jacka, F., southern auroral zone defined by homogeneous arcs, **3310**
Jackson, C. H., with others, evaporated-point-contact rectifiers, **2179**
Jackson, K., and R. O. Jenkins, use of Ni in valves, **2357, 3629**
Jackson, W., with M. M. Z. Kharadly, properties of artificial dielectrics including arrays of conducting elements, **2902**
Jacob, L., with W. W. H. Clarke, characteristics of l.v. electron immersion objective, **2410**
Jacob, P. B., Jr, and G. M. L. Sommerman, dependence of breakdown direct voltage on humidity and time, **2290**
Jacobs, H., J. Freely and F. A. Brand, mechanism of field-dependent secondary emission, **998**
Jacot, H., digest of Wiener's theory of stationary time series, **328**
Jaffe, H., with W. R. Cook, Jr, ferroelectricity in oxides with fluorite crystal structure, **1374, 2324**
de Jager, F., delta modulation, **3712**
—— with others, delta modulation, **543**
Jager, J., with H. H. van Abbe, application of Type-DK92 heptode at 30 Mc/s, **813**
Jain, S. C., and K. S. Krishnan, thermionic constants of metals of the first transition group, **1392, 2700**
Jakes, W. C., Jr, wide-band matching with directional coupler, **29**; analysis for microwave aerial with plane reflector, **1243**
James, I. J. P., fluctuation noise in television-camera amplifier, **1837**
Jan, J. P., temperature variation of Hall effect in Fe and Ni, **1706**
Jancel, R., and T. Kahan, effects of crossed magnetic and alternating electric fields in ionosphere, **1995**; propagation of plane e.m. waves in ionosphere, **2766**
—— with T. Kahan, conductivity and dielectric tensors for ionized medium, **2291**
Janes, R. B., with others, performance of vidicon camera tube, **249**
Janisz, T., a.f. filters using negative feedback, **3545**
Jansen, C. G. J., and R. Loosjes, velocity distribution of electrons of pulsed thermionic emitters, **2837**; graphs for calculation of work function of thermionic emission, **3583**
Jasberg, J., high-power klystron amplifier, **3161**
Jassin, H., attenuation measurements on coaxial cables in range 1 Mc/s–4 kMc/s, **2072**
Jaynes, E. T., impedance in periodically loaded waveguides, **626**
Jeffress, L. A., H. C. Blodgett and B. H. Deatherage, masking of tones by noise as function of interaural phase, **9**
Jehn, K. H., and R. C. Staley, correlations of 100-Mc/s propagation with meteorological effects, **2772**
Jekelius, K., permanent-magnet focusing for c.r. tubes, **573**
Jenkins, H. G., A. H. McKeag and E. E. Welch, phosphors for television c.r. tubes, **1869**
Jenkins, J. A., and R. A. Chippendale, high-speed photography by means of image converter, **2751**
Jenkins, J. B., automatic measurement of ionospheric absorption of oblique-incidence signals, **2313**
—— and G. Ratcliff, automatic measurement of ionospheric absorption of vertical-incidence pulse signals, **1680, (D)3305**
Jenkins, R. O., with K. Jackson, use of Ni in valves, **2357, 3629**
Jennings, R. E., with others, phase stability of electron cyclotron (microtron), **2090**
Jennings, W. W., and P. Vanet, direct-vision stereo-projection screen, **375**
Jenny, F., with others, Swiss developments in h.f. technology, **1548**
Jensen, E. E., and B. W. Currie, orientations of auroral displays in Canada, **3307**
Jepsen, R. L., and T. Moreno, f.m. distortion in reflex klystrons, **1545**
Jerome, C. W., with others, electroluminescence, **2956**
Jerrard, R. P., with H. Poritsky, integrable case of electron motion in electric and magnetic field, **76**
Jesty, L. C., colour television, **(D)1493**; television as a communication problem, **1820**
Jeudon, A., electronic balance, **3685**
Jinkings, P. W., 400-W h.f. 4-channel transmitter Type HC.100, **3135**
Joffe, A. F., with A. V. Joffe, relaxation processes in rectifying pairs of semiconductors, **3620**
Joffe, A. V., and A. F. Joffe, relaxation processes in rectifying pairs of semiconductors, **3620**
Johannin, P., with J. P. Pérez, piezoelectric resonance of quartz up to 5000 atm, **442**
John, H., with W. Grattidge, electronic properties of BaS, **893**
—— with others, double activators in oxide-cathode base alloys, **3152**
Johnson, E. G., and A. O. Nier, aberrations in sector-shaped e.m. lenses, **3680**
Johnson, G. F., television a.g.c. circuit, **250**
Johnson, G. H., effect of impurities on conductivity of TiO_2, **2683**
Johnson, H., with L. J. Giacoletto, u.h.f. triode design, **1536**
Johnson, H. R., and J. R. Whinnery, travelling-wave-valve oscillators, **1872, (C)3750**, with electronic tuning, **3454**
Johnson, L. J., high-speed magnetic amplifier, **3512**
Johnson, M. H., electric and diffusion currents in E-layer displacements, **385**
Johnson, R. A., with others, measurement of small-signal parameters of transistors, **3358**
Johnson, S. L., television studio lighting equipment, **864**
Johnson, V. A., and F. M. Shipley, adiabatic Hall effect in semiconductors, **3018**
—— and W. J. Whitesell, theory of magnetoresistive effect in semiconductors, **2329**
—— with others, low-temperature Hall curve for n-type Ge, **426**
Johnson, W. F., commercial radar equipment, **730**
Johnston, D. L., with G. W. A. Dummer, printed and potted electronic circuits, **[illegible]**
Johnstone, C. W., new design of pulse-height analyser, **1920**
—— J. F. Kalbach and H. J. Lang, telemetry system for large e.s. accelerator, **794**
Jolivet, P., new e.s. influence machine, **2459**; new electrical insulating material, **3684**
Jolly, A. C., with C. V. Drysdale, Electrical Measuring Instruments: Part 1, **(B)2398**
Jona, F., with others, anisotropy of dielectric constant of ice, **2027**
Jones, A. F., suppression of radio interference from telephone apparatus, **1178**
Jones, C. H., effects of noise on N.T.S.C. colour standards, **2467**
Jones, D. S., diffraction, simplifying technique for problems in, **374**, inconsistency in theory of, **696**, by an edge and by a corner, **711**, by thick semi-infinite perfectly conducting plate, **2295**
Jones, E., S. Edelman and A. London, long-tube method for determination of sound absorption, **13**
—— with others, television valves and a.c./d.c. receivers, **1503**
Jones, E. M. T., and R. A. Folsom, Jr, circular dielectric-disk aerial, **2572**
Jones, F. L., British Association discussion on electrical discharges in gases, **701**; initiation of discharges at electrical contacts, **3579**
—— and C. G. Morgan, surface films and field emission of electrons, **3267**
—— and E. T. de la Perrelle, field emission of electrons in discharges, **1962**
—— and G. C. Williams, low-pressure breakdown of gases in nonuniform fields, **2630**
—— with others, time lags in electrical breakdown of gases, **3262**
Jones, G. E., Jr, harmonic-distortion meter, **1078**
Jones, H. Spencer, and P. J. Melotte, harmonic analysis of geomagnetic field for epoch 1942, **3279**
Jones, R. E., measurement of phase change of ionosphere pulse echoes, **3599**
—— G. H. Millman and R. J. Nertney, heights of ionospheric winds determined from long-wave measurements, **2311**
Jones, R. F., Montreal conference on application of radar in meteorology, **1361**
Jones, R. V., with W. Paul, absorption spectra of PbS at various temperatures, **2020**
Jong, A. S. G., with G. E. Burridge, transmission factors for power-line carrier network, **3704**
Jonker, G. H., and J. H. van Santen, ferromagnetic compounds of Co with perovskite structure, **2701**
Jonker, J. L. H., angular distribution of secondary electrons from Ni, **584**; short-length picture tube, **3737**
—— with others, decade tube for high counting rates, **3762**
Jordan, E. C., with others, meteorological effects on v.h.f. propagation, **[illegible]**
Jouguet, M., effects of amplitude and phase distortion on limited-spectrum television signals, **1177**
Jung, P., viscometer with servomechanism, **3673**
Junger, M. C., formula for acoustic field of vibrating cylinder, **1554**
Justi, E., and G. Lautz, impurity and intrinsic semiconduction of intermetallic compounds, **3619**

K

Kachickas, G. A., and L. H. Fisher, time lags of field breakdown in N_2, **1308**
Kaden, H., dielectric and metal waveguides, **28**; pulse response of cables with nonuniform characteristic impedance, **2070**; characteristics of coaxial cables with helical-strip insulation at frequencies > 1 kMc/s, **3184**
Käding, H., hinged mast for mobile television transmitter, **1160**
Kafka, H., design of voltage transformers, **1599**
Kahal, R., synthesis of quadripole networks, **1263, 3538**
Kahan, T., and R. Jancel, conductivity and dielectric tensors for ionized medium, **2291**
—— with R. Jancel, effects of crossed magnetic and alternating electric fields in ionosphere, **1995**; propagation of plane e.m. waves in ionosphere, **2766**
Kahn, F. D., possible radiation mechanisms of radio stars **1328**
Kahn, L., high-temperature operation of metallized-paper capacitors, **345**
Kaisel, S. F., with others, developments in travelling-wave valves, **1524**
Kaiser, T. R., and J. S. Greenhow, decay of radio echoes from meteor trails, **1978**
—— with others, radio reflections from meteor trails, **1979**
Kaiser, W., audiometer at Technische Hochschule, Stuttgart, **1891**
—— with E. Zwicker, modulation threshold in audible range, **1892**
Kalashnikov, S. G., and Ya. E. Pokrovski, influence of surface on type of conduction of semiconductor, **2686**
—— with L. A. Ignat'eva, resistance of metals at high current density, **1377**
Kalbach, J. F., with others, telemetry system for large e.s. accelerator, **794**
Kales, M. L., transmission modes in waveguides containing ferrites, **1586, 2888**
Kalinin, V. I., and T. P. Ryazonova, theory of multisegment magnetron, **3458**
Kallenbach, W., tone-pitch recorder for phonetics research, **1226**
Kallmann, H., B. Kramer and A. Perlmutter, induced conductivity of luminescent powders, **2021**
Kallmann, H. E., remodulation in cascade-type electron multipliers, **1519**
Kallmann, H. K., continuous layer formation in atmosphere under influence of solar radiation, **2651**; physical properties of atmosphere between 80 and 250 km height, **3286**
Kalmus, H. P., J. C. Cacheris and H. A. Dropkin, nonquantized f.m. altimeter, **3311**
Kaltbeitzer, K. H., with R. Gressmann, determination of service area for planning u.s.w. networks, **213**
Kambe, K., hysteresis loops of $BaTiO_3$ ceramic at h.f., **3013**
—— I. Nakada and H. Takahasi, hysteresis loops of $BaTiO_3$ ceramic at h.f., **3012**
Kamiyama, H., statistical study of minimum frequency in E-region $h'f$ curve, **2654**
Kan, M., with others, frequency-sweep $h'F_2$ measurements, **3297**
Kanai, Y., transistor action of Si crystals, **2823**
Kanaya, S., with others, attenuation characteristics for h.f. and m.f. waves, and application to field-strength calculations, **2774**
Kandiah, K., and D. E. Brown, high-gain d.c. amplifiers, **172**
Kandoian, A. G., R. A. Felsenheld and W. Sichak, high-gain loop aerial for television broadcasting, **1236**
Kane, D. F., with others, lattice constants and dielectric properties of $BaTiO_3$-$BaSnO_3$-$SrTiO_3$ ceramics, **1718**
Kangro, C., with R. Suhrmann, semiconductor properties of systems K-Sb, Cs-Sb, K-In, Cs-In, **2030**
Känzig, W., with others, properties of very small ferroelectric particles, **3007**
Kapp, R. O., calculation of transmission-line constants, **619**
Karbowiak, A. E., with H. M. Barlow, cylindrical surface-wave resonator for determination of velocity of short e.m. waves, **3355**
Karo, D., shunted T circuit for impedance measurements from a.f. to v.h.f., **1082**
Karolus, A., colour television, **239**; tuning-fork type of quartz oscillator for 1–20 kc/s, **2287**
Kasemir, H. W., studies of atmospheric potential gradient, **1354**
—— with H. Israël, studies of atmospheric potential gradient, **1355**
Kaspin, B. L., and others, magnetic striping techniques, **2206**
Kassander, A. R., Jr, with R. M. Stewart, Jr, electronic statistical tabulator, **2369**
Kassel, K., effect of lattice defects on optical absorption of Cu_2O, **1384**
—— with G. Blankenburg, semiconductor properties of Cu_2O in relation to production methods, **1383**
Kästner, S., with R. Altenburg, demodulation of ultrasonic waves in liquids, **2864**
Kates, J., improving read-around ratio in c.r. storage tubes, **3353**
—— and V. G. Smith, Scotch-plaid raster for c.r. tube digit storage, **3649**
Kato, Y., new theory of magnetic storms, **2646**
—— and J. Ossaka, variation of geomagnetic field during bay disturbances, **2972**
Katsman, Yu. A., oscillations of uniform electron beams, **3144**
Katz, H., metal capillary cathodes, **3148**
Katzenstein, H. S., with S. S. Friedland, factors influencing life of self-quenching counters, **2104**
Kaufman, H., with R. L. Sternberg, theory of multiple nonuniform transmission lines, **1581**
Kaufman, S., analogue computer for geophysical data, **2718**
—— with H. H. Wieder, plastic electrets, **2025, 3323**
Kaufmann, A., applications of tensor theory to linear electronic circuits, **659**
Kauke, J., negative resistance in Ge diodes, **2180**
Kawamura, S., with K. Noga, photoelectric emission from BaO, **2322**
Kazanowski, E. F., with W. P. Bennett, 1-kW tetrode for u.h.f. trans-

mitters, **1206**
Kazarnovski, D. M., variation with time of the dielectric properties of ferroelectric ceramics, **2026**
Kear, F. G., with others, multiple television and f.m. aerial system, **1589**
Keck, P. H., and J. Broder, solubility of Si and Ge in Ga and In, **3033**
Keen, A. W., scanning-current linearization by negative feedback, (A)**248**; anode-follower derivatives, **658**; precision synchronizing system for large-screen television equipment, **1812**; reduction of pulse interference in television receivers, **1843**; triode transformation groups, **3529**
Keidel, L., methods and apparatus for room-acoustics measurements, **606**; multiple-Rayleigh-disk mesh arrangement, **1228**
Keil, A., and G. Offner, production and testing of precious-metal coatings on insulating materials, **2052**
Kelbg, G., with H. Falkenhagen, optical method for determining permittivity and permeability, **995**
Kelen, A., micromanipulator for location of point contacts on semiconductors, **2999**
Kell, R. D., and A. C. Schroeder, optimum utilization of r.f. channel for colour television, **3431**
Keller, J. B., diffraction of pulse by 90° wedge, **986**
Keller, K., with others, thermally produced lattice defects in Ge, **1697**
Kelly, J. M., J. O. Stenoien and D. E. Isbell, microwave measurements on metal powders suspended in wax, **2326**
Kelly, S., piezoelectric-crystal pickups, **1904**
Kel'man, V. M., and I. V. Rodnikova, motion of charged particles in e.m. field of linear current and e.s. field of cylindrical capacitor, **75**
Kelso, J. M., determination of vertical distribution of electron density in ionosphere, **409**
—— and others, polarization of vertically incident long radio waves, **806**
Kemény, Á., with Á. Bardócz, electronic spark timing device, **455**
Kemp, E. L., gated decade counter, **1256**
Kemp, L. G., with G. J. Hunt, group-delay-distortion measuring equipment, **1076**
Kemp, W. D., television recording, **847**, **2468**
Kempthorne, O., The Design and Analysis of Experiments, (B)**1419**
Kende, G., borocarbon resistor characteristics, **340**
Kent, E. L., and C. J. Tennes, electronic musical instrument, **317**
Keonjian, E., and J. S. Schaffner, experimental investigation of transistor noise, **887**; noise in transistor amplifiers, **1288**, **2279**
Kerker, M., with others, scattering and attenuation by nonspherical atmospheric particles, **2314**
Kerkhof, F., and W. Werner, Television, (B)**578**
Kerr, F. G., harmonic distortion and negative feedback, (D)**3253**
Kersta, L. G., solid sound, **11**
Kessler, G., direct-voltage valve amplifier, **981**
Kessler, W. J., and S. P. Hersperger, recent developments in radio location of thunderstorms, **1020**
Ketchledge, R. W., and T. R. Finch, equalization and regulation in L3 coaxial-cable system, **3410**
Kettel, E., stability of quartz-controlled oscillators, **1274**; quartz-crystal circuit with variable coupling as f.m. oscillator and discriminator, **1277**
Khalek, A., annual variation of reduced density and mean temperature of atmospheric ozone in Afghanistan, **2979**
Kharadly, M. M. Z., and W. Jackson, properties of artificial dielectrics including arrays of conducting elements, **2902**
Khodakov, A. L., with I. N. Belyaev, dielectric properties of $PbTiO_3$ single crystals, **1410**
—— with others, dielectric properties of $BaTiO_3$ single crystals, **3009**; composition and properties of $BaTiO_3$ ceramics in strong fields, **3010**
Khokhlov, M. Z., with others, single-electrode discharge at 31·7 Mc/s, **1307**
Kiely, D. G., waveguide rotary switch, **2241**; experiments with single-wire transmission lines at 3-cm wavelength, **3186**
v. Kienlin, U., with others, aerial systems for 24-channel p.p.m. beam R/T system, **822**
Kietz, H., stereoaudition, **2546**
Kihlberg, G., with others, integrating amplifier for c.r.o. recording of magnetic flux, **3062**
Kijakowski, G. W., slow-acting deflection-synchronization circuits, **3786**
Kikuchi, M., and T. Onishi, investigations of electrical forming of Ge rectifiers, **2032**
Kilvington, T., cable links for television outside broadcasts, **1145**
Kinchin, G. H., electrical properties of graphite, **2051**
Kinder, E., design of small electron microscopes, **2756**
King, D. D., with S. H. Dike, gain and back scattering cross-section of cylindrical aerial, (D)**2894**
King, G., and others, microwave techniques for communication links, **219**
King, L. H., reduction of forced dynamic error in closed-loop systems, **3423**
King, R. W. P., dipole with tuned parasitic radiator, (D)**324**; aerials, electrically short, theory of, **628**, cylindrical, (D)**629**; alternative method of solving Hallén's equation, **1908**
King, W. C., and W. Gordy, spectroscopy at 1–2-mm λ, **2823**
Kingdon, B. E., circular waveguide magic-T and its applications, **3219**
Kintner, P. M., flux-charge concept in magnetic-amplifier analysis, **337**
Kip, A. F., with others, electron-spin resonance in Si semiconductor, **3342**
Kirby, M. J., and R. M. Giulianelli, stability of varying-element servomechanisms, **3723**
—— with others, servomechanism transient performance from db/log-f plots, **3721**
Kirschbaum, H. S., analysis of parallel-connected magnetic amplifiers, (D)**944**
Kirschner, F., with T. Korn, analysis of transient acoustic phenomena by means of reduced-scale models, **921**
Kirschner, U., general rules for Laplace transformation, **764**; modulation problems, **2439**; realization of a.c. resistance, **3493**
Kirschstein, F., frequency allocation at 1952 European Broadcasting Conference, Stockholm, **1799**
—— and H. Bodeker, modulation distortion in television reception, **260**
Kiryluk, W., voltage-regulator tubes, **1871**
Kitagaki, T., focusing method for large accelerators, **2406**
Kitai, R., impulsive e.m. fields, **88**; pulse response of a.m. receiver, **1115**
Kitchen, F. A., and K. W. Tremellen, ionospheric influences in television reception, **1176**
—— B. G. Pressey and K. W. Tremellen, ionospheric propagation of v.l.f., l.f. and m.f. waves, **1781**
Kittel, C., with others, electron-spin resonance in Si semiconductor, **3342**
Kiyasu-Zen iti, Nobuiti Ikeno and Sigeharu Yamada, networks with maximally flat delay, (D)**2259**
Klasens, H. A., fluorescence centres and traps in ZnS, **2024**
—— with A. Bril, intrinsic efficiencies of phosphors under c.r. excitation, **3607**; new phosphors for flying-spot c.r. tubes, **3608**
Klätte, G., cut-off attenuators for waveguide circuits, **1938**
Klein, C. A., production of radio waves by means of the Tcherenkov effect, **1970**
Klein, W., problems of radio transmission for mobile telephony systems, **1486**, **3417**; measurement of cm-wave attenuation factor of quadripoles, **2071**; equivalent circuits using negative two-pole elements, **2247**; equivalent-circuit diagrams for transistors, **3522**
—— and W. Friz, characteristics of travelling-wave valve with dispersive delay line, **2826**
Kleinknecht, H., Si single-crystal rods, **422**
Kleinwachter, H., calculation of electron paths by means of complex vector loci, **77**; excitation of e.m. fields by current waves, **279**; travelling-wave valve with corrugated rectangular waveguide, **1186**
—— and H. Weiss, consequences of amplitude spectrum in pulse technology, **3105**
Klemperer, O., electron optics symposium, **3681**
de Klerk, J., automatic c.r.o. trace brightening, **3369**
Klick, C. C., luminescence and photoconductivity of CdS at edge of absorption band, **1691**
Klie, R. H., with others, L3 coaxial-cable carrier system, **3409**
Kline, H. W., industrial frequency standard, **456**
Klipsch, P. W., historical development of corner type of loudspeaker unit, **3178**
Kloot, N. H., with E. J. Williams, interpolation in series of correlated observations, **2362**
Klopfenstein, R. W., impedance matching with transformer sections, **2248**
von Kluber, H., corona observations at solar eclipse, 25th Feb. 1952, **716**
Kluck, J. H., and R. E. Larson, S-band frequency-sweep generator and test set, **3671**
Kluge, W., control of self-maintained discharge currents by illumination of cathode, **3264**
—— and S. Weber, pulse irradiation of composite photocathodes, **3448**
van der Knaap, P. D., with others, ECL80 and EQ80 valves in flywheel synchronizing circuits, **2168**
Knechtli, R., with H. J. von Baeyer, analysis of multiconductor systems with h.f. TEM waves, **26**
Knight, C. R., and K. C. Harding, specifications for reliable valves, **270**
Knight, G., Jr, R. A. Johnson and R. B. Holt, measurement of small-signal parameters of transistors, **3358**
Knight, L., coil winding data, **647**
Knol, K. S., and G. Diemer, h.f. diode admittance with retarding field, **290**
—— with G. Diemer, noise of electronic valves at v.h.f., **3758**
Knoop, E., gas-filled triodes, discharge processes in, **1542**, as pulse amplifier, **2274**
Knudsen, H. L., mutual radiation resistance of aerials and arrays, **32**; calculation of some definite integrals in aerial theory, **1238**; field of ring array of tangential or radial dipoles, **2570**; field in rectangular waveguide with longitudinal conducting membrane, **2882**
—— and M. Andreasen, theory of plane reflectors in aerial systems, **1913**
Kobayashi, A., with others, composition of Cs-Sb photocathodes, **2824**
Kobayashi, T., with others, field strength, of scattered waves in r.f. propagation, **2775**, h.f. sky wave, graphical calculation of, **2777**; frequency of occurrence of fE_s and $fminF$, **2985**
Kober, H., absorption in an electron-gas mixture, **2297**
Kobierski, H., investigations on R/T for trains, **225**
Koch, B., frequency stabilization in microwave range, **46**; radar measurement of velocity of projectiles, **174**; reflection of microwaves by explosion-wave fronts, **2086**
Koch, E., Weser-Ems power-supply carrier-current network, **2435**
Koch, K. M., with L. Halpern, Corbino effect and magnetic variation of resistance in Bi, **1710**
—— with A. Nedoluha, mechanism of resistance variation in magnetic field, **377**
Kock, W. E., acoustic gyrator, **1874**, **2532**
Koenig, J. F., design of damper-stabilized instrument servomechanisms, **549**
Koenigsberg, E., conductivity of thin films in longitudinal magnetic field, **3626**
Kohman, G. T., with others, polyethylene terephthalate as capacitor dielectric, **440**
Koike, Y., and S. Yamanaka, limiting frequency of triode oscillator, **1201**; amplification constants of triodes, **1537**
Kolb, E. D., with W. P. Slichter, Ge crystals, impurity effects in thermal conversion of, **116**, solute distribution in, **3343**
Kolb, O., with R. Feldtkeller, complex permeability of high-μ ferrite core, **1705**
Kollath, R., and D. Menzel, measurement of charge on moving electrons, **2958**
—— with R. Fleischmann, method for measuring charge of fast electrons, [illegible]
Koller, L. R., monolayer fluorescent screens, **3761**
Kolodziejczyk, L., influence of magnetic impulses on kinetic energy of electrons, **2300**
Kompfner, R., travelling-wave valves, **2183**
König, H. W., low-noise electron streams, **1183**
Kono, T., experiments on scattered echoes, **2776**
Konstantinova-Shlezinger, M. A., N. A. Gorbacheva and E. I. Panasyuk, thermoluminescence of sulphate-base materials, **3006**
Konstantinowsky, K., recent information on electrical breakdown, **3632**
Koppe, H., solar activity and the atmosphere, **1323**
Köppen, H., thermal grid emission and its elimination, **899**
Korchak, A. A., and Ya. P. Terletski, e.m. radiation from cosmic protons and r.f. radiation from galaxy, **1331**
Korman, N. I., E. B. Herman and J. R. Ford, analysis of microwave-aeral side-lobes, **41**, (C)**2226**
Korn, T., and F. Kirschner, analysis of transient acoustic phenomena by means of reduced-scale models, **921**
Kornblith, L., Jr, with others, synchrocyclotron for 450-MeV protons, **1764**
Kornetzki, M., relation between hysteresis coefficient and permeability, **756**; alternating-field losses in magnetic cores with air gaps, **1721**; nonlinearity of titanate capacitors, **2916**
—— and others, measurements on high-μ ferrite cores, **1032**
Koros, L. L., measurements on a.m. injection-locked magnetron transmitter, **1060**, **2483**
Koschel, H., with K. Braun, reference-level test equipment for telephone circuits, **777**
Kosmahl, H., with R. Gebauer, construction, properties, operation and applications of klystrons, **596**
Kösters, A., acoustic particle-velocity measurements in liquids with Rayleigh disk, **305**
Kostriza, J. A., microstrip components, **623**, **2214**; composite-dielectric coaxial line, **3185**
Kotani, S., with T. Arizumi, gettering process of Ba, **2321**
Koteswaram, P., physical properties of upper atmosphere over India, **403**
Kotosonov, N. V., measurements of dielectric constant at cm λ, **2069**
Kouskoff, G., vector representation of sinusoidally varying quantities, **1919**
Kovacs, A., and P. Laurent, effect of fatigue on magnetic properties of Ni-Cr steels, **1037**
Kraft, L. G., with L. Weinberg, measurements of detector output spectra, [illegible]
Kramer, B., with others, induced conductivity of luminescent powders, **2021**
Kramer, J., surface investigations on metals and nonmetals with exo- and photo-electrons, **2301**
Krapf, S., magnetization characteristic of ferromagnetic materials, **1704**
Krastel, R., multimesh *RC* networks for phase-shift oscillators, **1627**; phase and group delay, **2258**
Kraus, J. D., and E. Ksiazek, beam aerial-array for radio astronomy at Ohio State University, **3490**
Krauss, H. L., with others, 3-terminal *RC* networks, cascaded, synthesis of, **656**, paralleled, synthesis of, **3536**
Krautz, E., spectroscopic investigation of oxide cathodes in gas discharges, **1188**
Kretsch, H. W., with J. F. Engelberger, electromechanical transducer for telemetry, **2412**
Kretzmann, R., photoelectric register-control devices, **1096**
Krishnan, K. S., with S. C. Jain, thermionic constants of metals of the first transition group, **1392**, **2700**
Krisilas, J. G., with others, liquid-dielectric r.f. coaxial cables, **3472**
Kroebel, W., direct-voltage amplifier, with high input resistance, **787**, for voltages down to 10^{-9} V, **2276**; location of cable faults by pulse-echo methods, **2727**
Kröger, F. A., A. Bril and J. A. M. Dikhoff, single-component white screen for television tubes, **111**
Krömer, H., theory of Ge rectifier and transistor, **2821**
Kronjager, W., and H. Wallor, Rhine R/T service, **542**
Krumbiegel, J., photoelectric measurements on ZnS single crystals, **732**
Krusen, F. H., with J. F. Herrick, physiological effects of microwaves, **2748**
Krzikalla, W., echo-sounding equipment with new indicating instrument, **1092**
Ksiazek, E., with J. D. Kraus, beam aerial-array for radio astronomy at Ohio State University, **3490**
Kudo, H., with others, *h't* ionosphere measurements at Wakkanai, Japan, during eclipse of 9th May 1948, **2659**
Kuh, E. S., potential-analogue network synthesis, **3530**
Kuhl, W., directivity of microphones on surface of sphere, **613**; properties of water-filled tubes for acoustic impedance and velocity measurements, [illegible]
Kühn, L., theory of magnetic amplifiers, **2909**
Kühne, R., magnetic-field measurement with iron-cored magnetometer by harmonic method, **165**
Kukel, J., and E. M. Williams, helical-winding structures in exponential-line pulse transformers, **2234**
Kulcsar, F., with D. A. Berlincourt, electromechanical properties of $BaTiO_3$ compositions, **1042**
Kulp, M., interference caused by interfering transmitters, **531**; effective value of interfering modulated oscillations, **1475**
Kumpfer, B. D., with others, high-power delay line for travelling-wave amplifier or oscillator, **2828**
Kuntzmann, J., J. Daniel and Min-Yuan Ma, stability of control systems, [illegible]
Kunze, P., and G. Schulz, l.v. counter tubes, **3085**
Küpfmüller, K., regulating systems with time delay, **2087**
Kurilsyna, E. F., magnetic viscosity of Ni-Zn ferrites, **3624**
Kurshan, J., extension of operating-voltage range of valve heaters, **287**
—— R. D. Lohman and G. B. Herzog, c.r. tube plots transistor curves, **1437**
—— with others, use of flying-spot scanner to study photosensitive surfaces, **890**
Kursunoglu, B., gravitation and electrodynamics, **1291**
Kurtze, G., linings for acoustically damped rooms, **1567**
—— and K. Tamm, measurements of sound absorption in water and aqueous solutions of electrolytes, **2196**
Kusal, V., Ohm's law for build-up phenomena, **638**
Kusters, N. L., with D. M. Murray, electromechanical a.c. line-voltage stabilizer, [illegible]
Kuwabara, G., fatigue of Ag-Cs photocells, **3137**

L

Laaff, O., parabolic aerials with extremely good matching, **326**; approximate determination of transmitter range, **2414**
Labhart, H., antiferromagnetism, **3585**
Labin, É., channel width for colour-television transmission, **2805**
Labrie, L. J., with D. F. Ciccolella, h.f. crystal units for filter networks, **3552**
Labrum, N. R., scattering of radio waves by particles, **1362**, at cm λ, **1363**
Labus, J., space-charge waves, influence of Lorentz force on, **2182**, in electron streams, **2486**
Lacam, A., and J. Noury, velocity of ultrasonic waves in Ar at pressures up to 950 atm, **1559**
Lacour, H. R., with others, plastic deformability of Ge, **2033**
Lacy, R. E., and C. E. Sharp, f.m. microwave radio relay equipment, **1127**
Laett, H., the Dôle as site for television transmitter, **246**; design of compensated wide-band amplifiers, **1949**
—— and J. Dufour, the Dôle as site for television transmitter, **2166**
Lafferty, R., abac for correction of Q-meter errors due to valve-voltmeter loading, **783**
Lagasse, J., with M. Teissié-Solier, generators of repeated surge waves, **1088**
Lagrenaudie, J., properties of boron, **1696**, **2031**
—— with others, conductance of semiconductor in electric field, **1695**; preparation and properties of arsenide semiconductors, **3325**
Lahure, L., and J. Fontaine, radio equipment and navigation aids aboard ship, **3418**
Lallemand, A., electron-multiplier photocells, **1853**
Lally, P. M., space-harmonic travelling-wave valve, **2831**
Lalmi, —, with — Quiquandon, central telecommunications office for civil aviation, **3419**
Lamb, J., ultrasonics in liquids, **1563**
Lambert, D. E., coaxial-line v.m. oscillator for f.m. radio links, **1211**
Lamoral, R., absorption coefficient of acoustic materials, **3465**
Lampert, M. A., and A. D. White, microwave technique for studying gas discharges, **3263**
—— with L. Goldstein, new linear passive nonreciprocal microwave circuit component, **1265**, **3232**
—— with others, microwave determination of electron density and collision frequency in gas discharge, **380**
Lanczos, C., solution of systems of linear equations, **145**
Lander, G., analogies between electrical and mechanical devices, **988**
Landesman, S., distortion in class-A push-pull amplifiers, **2610**
Landmark, B., polarization of magneto-ionic z-component, **1775**
—— with L. Harang, 35- and 74-Mc/s pulse echoes observed during aurorae and geomagnetic storms, **2976**
Landsberg, P. T., note on theory of semiconductors, **78**
Landseer-Jones, B. C., theory of aurora, **1358**
Lane, A. L., design techniques for high-frequency transducer with wide-angle beam, **3167**
Lane, J. A., and J. A. Saxton, dielectric dispersion in electrolytes at u.h.f., **698**
—— with A. C. Grace, direct-reading standing-wave indicator, **3066**
Lane, P. E., with W. A. Prowse, u.h.f. breakdown of gas in crossed electric fields, **3261**
Lane, R. N., with others, reverberation chamber with polycylindrical walls, **922**
Lang, R. C., with J. J. Baruch, analogue computer for use in loudspeaker design, **3050**
Lang, H. J., with others, telemetry system for large e.s. accelerator, **794**
Lange, H., selective frequency-spectrum analyser, **2073**
de Lange Dzn, H., investigation of flicker, **1841**; decrease of i.f. signal/noise ratio when increasing i.f. bandwidth, **3404**
Lange, T., investigation of cavitation by ultrasonics, **1560**; measurement of sound attenuation by ceilings, **2871**
Lange, W., variable inductance and application to frequency-sweep oscillators, **683**
Lange-Hesse, G., 27-day variations of D-layer r.f. absorption over Singapore and Slough, **2660**
Langenberger, A., 16th plenary assembly of C.C.I.F., Florence, Oct. 1951, **533**
Langton, N. H., and N. Davy, field above and below infinite corrugated sheet, **2965**
—— with N. Davy, external magnetic field of single thick plate, **2293**
Larach, S., and J. Turkevich, interaction of Mn activator ions in Zn_2SiO_4·Mn phosphors, **2323**
Larguier, R., electronic speed regulators, **1451**
Lark-Horovitz, K., with W. M. Fecker, semiconducting Ge films, **3615**
Larson, R. E., with J. H. Kluck, S-band frequency-sweep generator and test set, **3671**
Lasof, S., with others, use of flying-spot scanner to study photosensitive surfaces, **890**
Latham, D., B. D. Power and N. T. M. Dennis, working fluids for diffusion pumps, **1686**
Latimer, K. E., and H. B. MacDonald, possible applications of ferrites, **1396**
Latour, M., magnetic amplifiers, (D)**943**
Latzel, G., with W. Holle, reciprocity calibration of capacitor microphones, **2544**
Lauber, A., acoustic resonators as sound absorbers, **310**
—— with W. Furrer, reverberation-time measurements with warble tones and with white noise, **1571**; 'diffusion' in room acoustics, **1893**
Laudet, M., calculation of potential due to uniformly charged disk, **1651**; field of cylindrical e.s. lens with three slits, **2094**
—— and P. Pilod, potential distribution in e.s. electron lens, **3383**
Lauer, H., operating modes of servomechanism with nonlinear friction, **3421**
Laurent, P., with A. Kovacs, effect of fatigue on magnetic properties of Ni-Cr steels, **1037**
Laurent, T., design of filters by Wagner's methods, **1931**
Lauter, E. A., and G. Bartels, optical refraction and u.s.w. propagation in Baltic area, **521**
Lautz, G., with E. Justi, impurity and intrinsic semiconduction of intermetallic compounds, **3619**
Lavaitte, A., with J. Pottier, current and voltage regulators, **3725**
Lavender, R. W., instruments for testing camera shutters, **2750**
Laver, F. J. M., F. M. Billinghurst and F. J. Lee, automatic-scanning receiver for radio monitoring, **2122**
Law, H. B., 3-gun shadow-mask colour kinescope, **575**
Law, R. R., and others, Ge p-n-p-junction transistor, **876**
Lawrance, R., photovoltaic effect in natural PbS, (C)**2018**; temperature dependence of drift mobility in Ge, **2332**
—— and A. F. Gibson, measurement of drift mobility in semiconductors, **1379**
Lawrence, R. S., maps of 4 ionospheric disturbances, **3296**
Lax, L., and D. Weighton, gamma-control circuit using crystal diodes, **1826**
Leblond, A., O. Doehler and R. Warnecke, new magnetron oscillator with interdigital circuit, **2187**
—— J. Nalot and O. Doehler, natural oscillations and mode changes in multicavity magnetrons, **1543**
Le Bot, J., and S. Le Montagner, measurement of dielectric constant at cm λ, **2067**; s.w.r. meter for the 9·5-kMc/s band, **3368**
—— with S. Le Montagner, measurements of dielectric constants at 9.5 kMc/s, **2068**
Lebow, I. L., with others, phase-bistable transistor circuit, **3515**
Le Couteur, K. J., perturbations in magnetic deflector for synchrocyclotrons, **2091**
Ledinegg, E., and P. Urban, theory of waveguides, **1582**; theory of forced oscillations in electrodynamic systems, **1622**; first boundary-value problem of Maxwell's equations, **1641**; bandwidth of cm-λ bandpass filters, **1985**; susceptibility of linear antiferromagnetic chain, **2633**
Lee, E. M., radio and television interference problems, **1179**
Lee, E. W., magnetostriction, **1976**
Lee, F. J., with others, automatic-scanning receiver for radio monitoring, **2122**
Lee, G. W., broadcast transmitter remote control system, **2768**

van Leeuwen, C. J., with others, l.f. noise in valves, **1202**
van Leeuwen, F. J., measurement of tension of microphone diaphragms, **2200**
Leevers, N., magnetic recording in cinema-film production, **21**
Léger, P., with P. Prugne, uniform metallization of surfaces by thermal evaporation, **428**
Lehmann, G., rotary amplifiers in servomechanisms, **2451**
Lehmann, H., control characteristics of half-wave self-saturated magnetic amplifiers, **3505**
Lehnert, W. E., factors concerning use of audio transformers, **2577**
Lehovec, K., photoelectric devices utilizing carrier injection, **888**
—— and others, evaporation of Ge films from carbon crucible, **3032**
Leisegang, S., astigmatism of electron lenses, **2097**
Leiss, W. J., with others, moisture aging of powder-core toroids, **2355**
Leithammel, P., with others, integrating amplifier for c.r.o. recording of magnetic flux, **3062**
Le Montagner, S., and J. Le Bot, measurements of dielectric constants at 9·5 kMc/s, **2068**
—— with J. Le Bot, measurement of dielectric constant at cm λ, **2067**; s.w.r. meter for the 9·5-kMc/s band, **3368**
Lempicki, A., conductivity of MgO single crystals, **2327**; origin of secondary electrons, **2336**
Lenihan, J. M. A., velocity of 13·5-kc/s sound waves in air, **605**
Lennartz, H., h.v. generation for c.r.o. and television equipment, **2812**
Lenz, F., and M. Hahn, asymmetry of magnetic electron lenses, **2098**
—— with others, remanence in soft-iron circuits of magnetic electron lenses, **2102**
Leondes, C., and M. Rubinoff, DINA, digital analyser for Laplace, Poisson, diffusion and wave equations, **3045**
Leontovich, M. A., and S. M. Rytov, differential law of electrical fluctuations and influence of skin effect, **2951**
Le Page, L. S., and A. L. P. Milwright, radar and ice, **2673**
Lerner, R. M., effect of noise on frequency stability of linear oscillator, **362**
Leroy, R., reactive T or Π sections resolvable into two matched half-sections, **2590**
Leslie, R. W., and C. Gunn-Russell, remote control and automatic monitoring of Third Programme transmitter, **261**
Lettowsky, F., calculation of h.f. resistance of cylindrical conductors, **3188**
Levell, D. A., hard-valve pulse generator, **364**
Leveque, A., with G. Valladas, background noise in ionization-chamber amplifiers, **1634**
Levi, R., dispenser-type thermionic cathode, **2502**
Levin, M. J., and J. F. Reintjes, 5-channel analogue correlator, **2366, 2720**
Levine, A. K., with S. Levy, preparation of phosphor screens for colour-television tubes, **3440**
Levine, M. A., with W. H. Bostick, demonstration of magneto-hydrodynamic waves in ionized He, **89**
Levintov, I. I., approximation to 3/2-power law for finite cathode, **3757**
Levy, I. E., effect of impurity migrations on oxide cathodes, **1858**
—— with F. M. Dukat, cathode-interface effects in television receivers, [illegible]
Levy, S., and A. K. Levine, preparation of phosphor screens for colour-television tubes, **3440**
Lewin, L., mutual radiation resistance of aerials and arrays, **(D)627**; theory of waveguide-fed slots, **1915**
—— with others, microwave techniques for communication links, **219**
Lewis, B. G., nonlinear capacitors, **2915**
Lewis, F. D., u.h.f. television monitor, **247**
Lewis, H., with others, design of linear-phase low-pass filters, **1614**
Lewis, N. W., waveform computations by time-series method, **55, (D)1608**
Lewis, R. P. W., reflection of radio waves from layer with vertical and horizontal ionization gradients, **2418**
—— and D. H. McIntosh, diurnal and storm-time geomagnetic and ionospheric variations, **3300**
Lewis, V. S. E., differential amplifier, **(D)1637**
[illegible], G., with others, conductance of semiconductor in electric field, **1695**
Liberman, A. M., with others, experiments on synthetic speech sounds, **919**
Licklider, J. C. R., process of speech perception, **920**
Lidiard, A. B., spin degeneracy and theory of collective electron ferromagnetism, **1001**; overlapping energy bands and ferromagnetism, **1662**
Liebmann, G., solution of waveguide and cavity-resonator problems with resistance-network analogue, **(A)150**; pole-piece saturation in magnetic electron lenses, **3386**
Lied, F., physical interpretation of approximation to magneto-ionic equation, **515**
Lien, R. H., radiation from horizontal dipole, **1587**
Liénard, P., with G. Eckart, acoustical characteristic impedances and echoes in stratified media, **4**
Lilienfeld, J. E., and C. Miller, conductivity distribution within dielectric films on Al, **3528**
Lindberg, A., H. Neuert and H. Weidner, resonance in electrodeless h.f. gas discharge in magnetic field, **85**
Lindberg, O., Hall and related effects, **713, (C)1975**
Lindblad, B. A., radar investigation of 1950 δ-Aquarid meteor shower, **1320**
Lindell, A., and G. M. Wells, crystal valves, **264**
Lindeman, R. J., and C. E. Dean, tuner for u.h.f. television band, **1166**
Lindemann, W. W., and A. van der Ziel, flicker noise caused by interface layer, **1531**
Lindquist, R., ionizing effect in E layer near sunrise, **1346**; 16-kW panoramic ionospheric recorder, **3052**; polar blackouts recorded at Kiruna observatory, **3094**
Lindsay, P. A., and G. D. Sims, application of thermodynamics of irreversible processes to magnetron theory, **2847**
Lindström, G., with H. Atterling, 225-cm cyclotron at Stockholm, **506**
Ling, T. T., c.r.o. display of aerial radiation patterns, **3069**
Linke, J. M., variable time-equalizer for video-frequency waveform correction, **1178**
Linvill, J. G., transistor negative-impedance converters, **2582**
Linvill, W. K., sampled-data control systems, **3722**
—— and J. M. Salzer, analysis of control systems involving digital computers, **3075**
Lipinski, J., with others, microwave techniques for communication links, **219**
Lippel, B., high-precision analogue-to-digital converter, **450**; interconversion of analogue and digital data for measurement and control systems, **2365**
Lippert, G. D., and others, radio interference tests in field and laboratory, **2431**
Lippert, W., and W. Pohlit, electron-optical properties, of e.s. lenses, **795**
Lippert, W. K. R., representation of standing waves in acoustic impedance tube, **2867**
Little, C. G., and A. Maxwell, scintillation of radio stars during aurorae and magnetic storms, **396**
Little, V. I., standing-wave method for absorption measurements in polar liquids at 3 kMc/s, **2066**
Littmann, M. F., ultrathin magnetic-alloy tapes, **760**
Livingston, D. C., colour television, colorimetric analysis of systems of, **1816**, synchronous demodulator in N.T.S.C. receiver, **3129**
—— with R. M. Bowie, N.T.S.C. colour-television transmission system, **3194**
Livingston, M. S., with others, strong focusing synchrotron, **1454**, origin of, **3678**
Livingston, R. S., Oak Ridge 86-in. cyclotron, **181**
Lloyd, L. B., narrow-band spectrum analysis of p.p.m. signal, **470**
Lo, A. W., transistor trigger circuits, **351**
Lobanov, E. M., with others, action of electron stream on current sensitivity of Se and Ag_2S photocells, **3140**
Locher, H., h.f. measurement methods in textile industry, **177**
Lochner, J. P. A., and A. Semmelink, electroacoustics laboratory at School for the Deaf, Worcester, C.P., **8**
Lockhorst, D. A., with others, influence of magnetic field on resistance of Fe films, **1039**
Lode, T., with J. D. Goodell, multistable magnetic digit-storage devices, **449**
Lodén, L. O., with Y. Öhman, sunspots, flares, etc., observed at Stockholm in 1950 and 1951, **715**
Loeb, J., nonlinear servomechanisms, **831**, with filters, transients in, **1130**; information theory, applications to telecontrol and measurements, **1481**; London conference, Sept. 1952, on applications of, **3601**
—— with G. Cahen, pull-in of nonlinear oscillators with filtered output, **972**; calculation of attenuation in filtered oscillators, **2449**
Loeb, L. B., secondary processes in breakdown of gases, **997**
Loferski, J. J., infrared transmission of Ge single crystals, **417**
Lofgren, L., analogue computer for solving algebraic equations, **3041**
Lohman, R. D., complementary-symmetry transistor circuits, **3519**
—— with others, c.r. tube plots transistor curves, **1437**; transistor circuits for television, **2813**
Lombardi, P., Heaviside, Vaschy, Pupin and some others, **(D)2561**
London, A., with others, long-tube method for determination of sound absorption, **13**
Loofbourrow, K. E., and C. M. Morris, stable oscillators for u.h.f. television receivers, **900**
Looser, R. O., with C. W. Goodchild, measurement of phase delay in television transmission circuits, **1750**
Loosjes, R., with C. G. J. Jansen, velocity distribution of electrons of pulsed thermionic emitters, **2837**; graphs for calculation of work function of thermionic emission, **3583**
Loper, G. B., with others, instrumentation for geophysical exploration, **2749**
Lopukhin, V. M., and V. S. Nikol'ski, e.m. properties of plane grating, **3588**
—— with E. I. Vasil'ev, theory of helix-type travelling-wave valve, **3453**
Lord, A. V., standards converter for international television, **3432**
—— and C. B. B. Wood, variable-definition camera channel for appraisal of television standards, **1753**
Lord, H. W., turns index for pulse-transformer design, **(A)1250, 3500**
Lord, K. M., mechanized dip-soldering of television receivers, **2710**
Lorrain, P., with E. Everhart, Cockcroft-Walton voltage-multiplying circuit, **2151**
Loshakov, L. N., theory of wave propagation in electron beam, **382**
Loughlin, B. D., improvements in dot-sequential colour television systems, **(A)240**
Loughren, A. V., N.T.S.C colour-television signal, **2465**
Lovell, A. C. B., with others, velocity distribution of sporadic meteors, **3009**
Lovell, G. H., with others, amplifiers for L3 coaxial-cable system, **3411**
Lovelock, R. T., Ge rectifiers in television receivers, **1505**; Ge crystal valves, **1515**
Lowry, W. R. H., and W. N. Genna, independent-sideband s.w. receiver, **2425**
Lubchenko, A. F., with A. E. Glauberman, dielectric properties of $BaTiO_3$, **3011**
Lucas, D. H., properties of semiconducting ceramic glaze, **438**
Lucas, I., conductivity of ionosphere and geomagnetic tides, **2312**
Lucas, R. T., with others, electrical properties of glass-fibre paper, **1719**
Lucas, W. P., with H. E. Holman, continuous-motion system for televising motion-picture films, **851**
Luck, D. G. C., with G. H. Brown, principles and development of colour-television systems, **3428**
Ludeke, C. A., and C. L. Morrison, analogue computer for nonlinear differential equations, **2372**
Lüdi, F., influence of plasma oscillation in transit-time valves, **1525**; turbator, **2518**; inverted magnetron, **(D)2849**
Lueck, L. B., and W. W. Wetzel, performance of high-output magnetic tape, **1578**
Lueg, H., and E. Oberhausen, sawtooth-current generator for recording of time intervals, **152**
Lufcy, C. W., A. E. Schmid and P. W. Barnhart, improved magnetic servo amplifier, **(A)3724**
Luftman, A. S., with K. C. Hergenrother, improved single-gun storage c.r. tube, **1868**
Lugeon, J., radiosonde observations of wind by pulse equipment without responder, **2993**
Lummis, F. L., with others, capacitance effects in thin conductive films, **2682**
Lundquist, S., studies in magneto-hydrodynamics, **1660**
Lusby, W. S., with others, phosphor-photocell radiation detector, **1103**
Luscombe, G. W., television aerials, **1590**
Lüst, R., r.f. line emission of interstellar material, **96**
Lutz, S. G., transmission-line load impedance for maximum efficiency, **2219**
Lyon, J. A. M., and T. J. Dunsheath, correlation of temperature and electric-field strength during dielectric heating, **500**
Lyons, H., with others, microwave absorption spectrum of ND_3, **2298**

M

Ma, Min-Yuan, with others, stability of control systems, **1489**
Macdiarmid, I. F., 'sine-squared' pulse generator for testing television links, **1089**
MacDonald, A., with others, evaporation of Ge films from carbon crucible, **3032**
MacDonald, A. D., h.f. breakdown in Ne, **702**
MacDonald, D. K. C., and K. Sarginson, galvanomagnetic effects in conductors, **1974**
MacDonald, E. B., with K. E. Latimer, possible applications of ferrites, **1396**
Macek, O., measurements on television receivers, **2397**
Macelloni, —, and — Vannel, control towe s for civil aviation, **3419**
Machin, K. E., and F. G. Smith, occultation of radio star by solar corona, [illegible]
Macht, H. G., two-dipole model for main geomagnetic field and its secular variation, **1012**
MacKay, R. S., interesting nonlinear effects, **2273**
Mackenzie, K. A., with L. R. Hulls, electronic h.v. insulation tester, **480**
MacKnight, M. L., with R. L. Chasson, ethylene and ethyl alcohol as quenching agents in external-cathode G-M counters, **2105**
Macmullen, A., with others, nonlinear filtering and wave-shape multiplexing, **670**
Macnamara, T. C., with N. Collins, electronic camera in film making, **1830**
MacNaughton, M. M., properties of aperture electron lenses, **188**
Macnee, A. B., high-speed product integrator, **2058**
Macpherson, A. C., with R. W. Beatty, mismatch errors in microwave power measurements, **3661**
Madelung, O., and H. Welker, theory of mixed semiconductors, **2028**
Maecker, H., wave-theory calculation for total reflection, **1006**
Maeda, K., Y. Aono and T. Kobayashi, graphical calculation of h.f. sky-wave field strength, **2777**
—— with M. Hasegawa, conductivity of upper atmosphere deduced from diurnal variations of geomagnetic field, **2647**
Mager, A., influence of grain size on coercive force, **2341**
Magnus, W., infinite matrices associated with diffraction by an aperture, **2625**
Maillard, J., application of information theory to telecommunications and radar, **1792**
Maire, J., deterioration of propagation conditions since Aug. 1950 on Paris-New York decametre-wave circuit, **202**
Makedonski, V. L., with A. R. Shul'man, secondary emission from dielectrics under single-pulse conditions, **3008**
Malakhov, L. N., with S. M. Rivkin, effect of oxygen on PbS photoresistors, **3040**
Malan, D. J., air discharges and positive charge at bottom of thundercloud, **1683**
Malatesta, S., statistical study of communications, **819**
Malsch, F., Type-C3m amplifier pentode, **589**
Malsch, J., and H. Benecking, transistor properties and circuits, **44**
—— and F. W. Dehmelt, apparatus for drawing Ge single crystals, **2707**
Maltby, F. L., design of d.c. null detector, **3665**
Malter, L., with E. G. Ramberg, potential distribution between accelerating grid and parallel anode, **1534**
Malyavkin, L. P., with L. A. Vainshtein, alternating component in photocurrent under strong illumination, **3138**
Mandel, P., slightly delayed projection of television pictures, **241, 1155**; reversible process for recording on and reproduction from cinematograph films, **3125**
Mankin, A. H., corona suppression methods, **1806**; interference effects in magnetic recording heads, **2878**
Manning, L. A., determination of vertical distribution of electron density in ionosphere, **(D)1997**
—— O. G. Villard, Jr, and A. M. Peterson, double-Doppler investigation of meteor-trail echoes, **393**
—— with others, transmission by reflection from meteoric ionization, **2117**
Mansfield, R., and S. A. Salam, electrical properties of molybdenite, **2706**
Mansfield, W. V., with others, ground-to-air cochannel interference at 2·9 kMc/s, **1798**
Mantz, M. R., with others, Type E80T valve, synchronization of v.f.o. with, **2816**; multichannel LC/O circuits using, **2817**
Maple, E., with others, dynamo currents and conductivities in ionosphere, **1253**
Mapleton, R. A., diffraction patterns for solid delay lines, **2574**
Marchese, T. J., with others, recent developments in travelling-wave valves, **278**
Marcuvitz, N., with L. B. Felsen, slot coupling of rectangular and spherical waveguides, **3193**
Margolin, A. R., with others, a.f.c. of high-power klystrons, **2942**
Mariani, F., electron density in upper atmosphere, **3598**
Marique, J., response of a series of resonant circuits to e.m.f. whose frequency is a linear function of time, **1941**; action of unlimited train of telegraphic signals on resonant *RLC* circuit, **3241**
Markham, J. J., relations between energy and intensity in second-order acoustic fields, **2194**
Markov, G. T., excitation of circular waveguide, **2564**
Markow, G. R., with A. J. Hornfeck, multiplex telemetry system using teletype transmission, **1097**
Marks, M., synchronizing-signal clipper with unusual noise immunity, **252**
Markus, J., and V. Zeluff, Electronics for Communications Engineers, **(B)369**
Marmo, F., with others, format on of D layer, **2652**
Marshall, C. A., television converter, **2169**
Marshall, J., with J. Fischer, Type-6BN6 gated-beam valve as fast coincidence counter, **512**
—— with others, synchrocyclotron for 450-MeV protons, **1764**
Marshall, J. F., theory of secondary emission, **705**
Marshall, J. S., precipitation and lightning observed by radar, **2003**
Martin, A., with A. Fréon, simple mains-frequency pulse generator, **488**
Martin, D. L., and A. H. Geisler, permanent-magnet properties of Co-Pt alloys, **(D)2709**
Martin, J. R., and C. F. Schunemann, measurement of λ in mm, **2384**
Martin, L. H., ionospheric-disturbance forecasting, **3288**
Martin, P. N., transient conditions in transformers feeding half-wave rectifier circuit, **3501**
Martin, R. E., with others, reduction of loss in ferrite gyrators, **1610**
Martindale, J. P. A., lens aerials at cm λ, **3203**
Martinet, J., conduction mechanism in semiconductor complexes, **114**
Marton, L., J. A. Simpson and J. A. Suddeth, electron-beam interferometer, **3074**
Martyn, D. F., geo-morphology and F_2-region storms, **1673**; morphology of ionospheric variations associated with geomagnetic disturbance, **3301**
Martyn, D. F., with W. G. Baker, conductivity of ionosphere, **1352**
Marutake, M., effect of electric field on domain structure of Rochelle salt, **2050**
Mary, M., with others, electronic tachometer, **2747**
Marziani, M., propagation of wave front in dispersive medium, **390, 1007**
Mason, R. W., with others, precision phase comparator for l.f., **(A)483, 1080**
Mason, S. J., feedback theory and properties of signal flow graphs, **3531**
Mason, W. P., properties of a tetragonal antiferroelectric crystal, **1045**
—— and B. T. Matthias, properties of deuterated ADP, **1044**
—— W. H. Hewitt and R. F. Wick, modulators and gyrators using Hall effect in Ge, **1930**
Massey, H. S. W., recombination of gaseous ions, **999**
Masson, F. Y., high-speed d.c. amplifier, **1090**
Masucci, C., with others, Ge diode as video detector, **2475**
Mataré, H. F., blocking-layer interaction in and fluctuation statistics for transistrons, **586**; harmonic mixing with crystal diodes, **1791**
Matheson, R. M., and L. S. Nergaard, decay and recovery of pulsed emission of oxide-coated cathodes, **285**
Mathews, K. C., and R. C. Boe, application of nonlinear techniques in servomechanisms, **3111**
Matossi, F., effect of electric field on continuously excited phosphor, **2284**
—— and S. Nudelman, influence of electric fields on luminescence, **2283**
Matschinski, M., application of Maxwell's equations for 3-layered media to theory of movement of magnetic storms, **100**
Matthaei, G. L., filter transfer-function synthesis, **1611**
Matthias, B. T., with W. P. Mason, properties of deuterated ADP, **1044**
Mattson, R. H., and A. van der Ziel, shot noise in Ge filaments, **2035**
Maue, A. W., with H. Hönl, uniqueness of solutions in rigorous theory of diffraction, **373**
Maurer, P., with H. Ebel, new sound chamber of Technische Hochschule, Karlsruhe, **1889**
Mawardi, O. K., variational principle in acoustics, **2857**
Maxwell, A., with C. G. Little, scintillation of radio stars during aurorae and magnetic storms, **396**
Maxwell, D. E., measuring nonlinear distortion in a.f. equipment, **2735**
May, A. S., test equipment for the TD-2, **3063**
Mayaud, P. N., magnetic field in Adélie Land, May 1951–Jan. 1952, **2305**
Mayo, B. J., with A. F. Pearce, Type-R5081 reflex klystron oscillator for f.m. at cm λ, **1214**
Mayot, M., with É. Argence, calculation of true heights of ionospheric layers, taking account of geomagnetic field, **3290**
McAuslan, J. H. L., dekatron c.r.o. time marker, **771**
McCaig, M., preferred direction in permanent-magnet alloy, **2342**
McCain, C. E., with others, single synthetic CdS crystals, **135**
McConnel, E. D., c.r.-tube projector for large-screen cinema television, **1833**
McCreary, H. J., magnetic-cross valve and applications, **3502**
McCreary, R. L., W. J. Armstrong and S. C. McNees, axial-flow u.h.f. resnatron, **1208**
McCue, C. G., Green's reinterpretation of magneto-ionic theory, **3392**
McDonal, F. J., Fourier analyser, **2719**
McDuffie, G. E., Jr, pulse duration and repetition rate of transistor multivibrator, **882**
McElwee, E. M., with M. A. Acheson, reliability of valves, **271**
McGhee, H., with R. Theile, secondary-electron multipliers in image iconoscopes, **855**
McGregor, R. B., synchronous demodulator for colour television, **253**
McGuire, W. S., and A. G. Bird, radio bearer equipment for carrier telephone systems, **3412**
McIntosh, D. H., solar and terrestrial relations, **1983**
—— with R. P. W. Lewis, diurnal and storm-time geomagnetic and ionospheric variations, **3300**
McIntosh, R. O., hermetic seals, **2356**
McKeag, A. H., with others, phosphors for television c.r. tubes, **1869**
McKenzie, A. A., modern a.m. broadcasting transmitter, **3746**
McKinley, D. W. R., and P. M. Millman, long-duration echoes from aurora, meteors and ionosphere, **2060**
McKune, W. J., and M. F. Brust, subharmonics in series nonlinear circuit, **2929**
McLachlan, K. R., and R. Yorke, objective testing of pickups and loudspeakers, **19**
McLean, F. C., television modulation, **(D)1163**
McLeod, T. S., with others, circuit technique for f.m. microwave links, **226**
McMahon, M. E., with N. H. Ekenstein, pulse response of junction transistors, **3514**
McMahon, W., with others, polyethylene terephthalate as capacitor dielectric, **440**
McMullan, D., scanning electron microscope, **1768**, for opaque specimens, **3382**
McNees, S. C., with others, axial-flow u.h.f. resnatron, **1208**
McNicol, R. W. E., with others, ionosphere measurements at oblique incidence over eastern Australia, **807**
McQueen, J. G., Type-300 monitor for high-speed recurrent waveforms, **482**
McQuistan, R. B., determination of resistance/temperature characteristics of bulk semiconductors, **3614**
McVay, M. S., with J. D. Ryder, thermocouple a.f. wattmeter, **2394**
Meade, J. E., with A. E. Hastings, device for computing correlation functions, **131**
Meahl, H. R., and C. C. Allen, calibrating ammeters at frequencies > 100 Mc/s, **1075**
Medicus, G., with C. Wehner, probe measurements in hot-cathode gas diodes, **381**
Medkeff, R. J., and R. J. Parent, diode-bridge limiter for analogue computers, **2367**
Meerkamp van Embden, H. J., with others, steel c.r. tube for television receivers, **3132**
Megaw, E. C. S., e.m. waves and fluctuations, **1106**
Megla, G., external effects on u.h.f. resonators, **2932**
Meier, R., and K. Schuster, sound-wave propagation in piezoelectric crystals, **3014**
Meierdiercks, D. R., with H. Greenberg, ground-reflection phase-error characteristics of vertical aerial, **2221**
Meinke, H. H., graphical calculation of pass band of two-stage wide-band filters, **57**; designation of waves in waveguides, **2217**; modified exponential-line impedance transformer, **3533**

Meinshausen, G., with L. Pungs, magnetic demodulation, **3400**
Mellen, R. H., thermal-noise limit in underwater sound-signal reception, **106**
Melling, W. P., phase shifter for range 10–100 Mc/s, **3357**
Melotte, P. J., with H. Spencer Jones, harmonic analysis of geomagnetic field for epoch 1942, **3279**
Melville, W. S., magnetic modulators for pulsed radar, **2992**
Mendousse, J. S., nonlinear dissipative distortion of progressive sound waves, **1553**
Mengel, J. T., p.p.m. telemetry systems for rockets, **2404**
Mentzer, J. R., dielectric lenses in model measurements of radar echoing areas, **1366**
Menzel, D., with R. Kollath, measurement of charge on moving electrons, **2958**
Menzer, E., with K. Sittel, improved radiosonde, **497**
Meos, J., with G. Hellgren, location of aurorae with 10-m radar equipment, **728**
Mercier, J. M., and R. P. Musson-Genon, Si crystal detectors, **2190**
Merrithew, R. F., noise meter for production testing of transistors, **2385**
Mertz, P., influence of echoes on television transmission, **3441**
Merz, W. J., domain properties of BaTiO$_3$, **759**
Mesnard, G., thermionic properties of thoria, **2506**; thoria cathodes, **2507**, **2508**, **2840**, measurements relating to the filament of, **3151**
Message, S. W., with A. N. Hawthorn, laminated plastic insulating materials, **2353**
Met, V., and E. Skudrzyk, small apparatus using BaTiO$_3$ oscillator for ultrasonic testing of materials, **1756**
Mette, H., and H. Pick, electronic conductivity of anthracene single crystals, **3016**
Meunier, R., and M. Bonpas, enamel seal for thin mica windows, **3638**
Meyer, A. J. P., and P. Taglang, influence of magnetic field on polymorphic transformation in a ferromagnetic material, **2339**
Meyer, E., and L. Bohn, sound reflection at surfaces with periodic structure, **1895**
—— and H. G. Diestel, room-acoustics investigations with directive transmitters and receivers, **12**
—— and H. Oberst, resonance-type absorbers for water-borne sound, **308**
—— and K. Tamm, wide-band absorbers for liquid-borne sound, **1569**
Meyer, R., with S. Pakswer, arc drop and deionization time in inert-gas thyratrons, **3154**
Meyer de Stadelhofen, J., suppression of interference, caused by railway systems, **2131**, from fluorescent lamps, **2133**
Meyer-Eppler, W., communications research, **1479**; report on symposium on applications of communication theory, **2432**
Meyerhoff, A. A., and R. Graham, Jr, fixed-length transmission lines as circuit elements, **1272**
Michaels, E. L., loci of complex impedance and admittance functions, **2248**
Michard, R., physical conditions in sunspots deduced from spectral data, **1324**, **1669**
Michels, W. C., and R. C. Barbera, frequency-eliminating transconductance bridge, **59**
Middleton, D., statistical criteria for detection of pulsed carriers in noise, **2782**, **2783**
Mikhnevich, M. N., with others, coercive force of nonuniformly magnetized specimens, **3024**
Mildner, R. C., developments in h.f. transmitter cables, **2210**
Mileikowsky, C., and R. T. Pauli, 1·5-MV accelerator for heavy particles, **508**
Miles, J. G., magnetic amplifiers, types of, **2911**, bibliography on, and on saturable-reactor art, 1887 to mid-1951, **3506**
Miles, J. W., acoustic diffraction at aperture in plane screen, **1881**
Miles, R. C., design of voltage-regulator-tube circuits, **231**
Miles, V. G., radar echoes and lightning, **107**, **3306**
Miller, B. L., multicavity linear electron accelerator, **509**
Miller, C., with J. E. Lilienfeld, conductivity distribution within dielectric films on Al, **3528**
Miller, C. D., and A. Scharf, isotransport camera for 100 000 frames/sec, **2056**
Miller, C. F., with J. W. Gibson, electric strength of SF$_6$ at r.f., **3627**
—— with Y. A. Omar, characteristic impedance of rectangular coaxial transmission lines, **3474**
—— with others, r.f. properties of 16 insulating materials, **1716**
Miller, E. J., gramophone-pickup pre-amplifier, **315**
Miller, M., B. L. Waddell and J. Patmore, digital to analogue converter, **148**
Miller, R., with others, synchrocyclotron for 450-MeV protons, **1764**
Miller, S. E., and A. C. Beck, low-loss waveguide transmission, **1585**
Miller, T., r.f. field quenching of phosphors, **1370**
Millman, G. H., ionospheric winds, measurements at 150 kc/s, **720**, study of, **1676**
—— with others, heights of ionospheric winds determined from long-wave measurements, **2311**
Millman, P. M., with D. W. R. McKinley, long-duration echoes from aurora, meteors and ionosphere, **2000**
Millman, S., spatial-harmonic travelling-wave amplifier, **1187**
Mills, B. Y., positions of six sources of cosmic r.f. radiation, **717**
Mills, R. A., with A. J. Biggs, performance of television receiver installations in presence of interference, **1511**
Mills, R. L., with others, instrumentation for geophysical exploration, **2749**
Milnes, A. G., 3-phase transductor circuits for magnetic amplifiers, **949**
—— and C. S. Hudson, 400-c/s and 1·6-kc/s transductors, **3216**
—— and T. V. Vernon, saturable-core reference source for magnetic amplifiers, **2237**
Milwright, A. L. P., with L. S. Le Page, radar and ice, **2673**
Min-Yuan Ma. See Ma, Min-Yuan.
Minnis, C. M., E region during solar eclipse, 25th Feb. 1952, **1675**; ionospheric-storm-warning services, **2110**; longitude effect in F region, (**D**)**2307**; value of forecasts, (**D**)**2767**
Minorsky, N., oscillators including elements having inertia, **68**
Miquel, R., ionophone applied in ultrasonics, **2539**
Missen, J. I., push-pull transistor amplifiers, **3521**
Mitchell, D. W., with others, fundamentals of glass-to-metal bonding, **2712**
Mitchell, E. W. J., with L. D. Brownlee, variations of lattice parameters of semiconducting oxides, **115**
Mitchell, J. E., recent developments in vibrators and vibrator power packs, **228**
Mitoff, S. P., with others, fundamentals of glass-to-metal bonding, **2712**
Mitra, A. P., study of ionosphere by means of extraterrestrial radio waves, **1674**
Mittelmann, L. W., television test equipment, **2396**
Miya, K., and N. Wakai, characteristics of ionospheric disturbances during severe magnetic storms, **2967**
—— T. Kobayashi and N. Wakai, field strength of scattered waves in r.f. propagation, **2775**
—— T. Murata and H. Wada, propagation characteristics of obliquely incident pulse waves during solar eclipse 9th May 1948, **2770**
—— S. Ouchi and S. Kanaya, attenuation characteristics for h.f. and m.f. waves, and application to field-strength calculations, **2774**
—— with others, frequency of occurrence of fE_s and $f_{min}F$, **2985**
Miyazawa, H., photoelectric emission and energy structure of Cs$_3$Sb, **3004**
—— and S. Fukuhara, electrolytic conduction in Cs$_3$Sb, **2676**
—— and others, composition of Cs-Sb photocathodes, **2824**
Moats, R. R., mode interactions in magnetrons, **593**
Mode, D. E., coaxial-line filters, [illegible]
Mohrmann, J., German v.h.f. harbour radio, **1487**; tracking problem in superheterodyne receivers, **2126**
Mol, G., 220-Mc/s oscillator with TBW-6/6000 or TBL-6/6000 transmitting valve, **2270**
Mole, J. H., Filter Design Data for Communication Engineers, (**B**)**1955**, (**B**)**2280**
Moles, A., 3-dimensional representation of complex musical tone, **1219**, **3462**
Möllenstedt, G., chromatic losses of electrons in passage through matter, **704**
—— and H. Duker, emission-microscope surface images obtained with electrons due to oblique bombardment by ions, **2757**
Möller, H. G., transformer-coupled resonance galvanometer, **2388**
Monelli, R., input impedance of line, **1579**
Montgomery, H. C., noise in semiconductors, **122**; transistor noise in circuit applications, **643**
Montroll, E. W., with G. F. Newell, theory of Ising model of ferromagnetism, **2964**
Moon, J. H., errors in u.h.f. direction finding in aircraft, **414**
Moon, P., and D. E. Spencer, coordinate systems associated with elliptic functions, **3347**
Moore, A. D., correlative property of 2-dimensional fields, **3573**
Moore, A. R., with others, use of flying-spot scanner to study photosensitive surfaces, **890**
Moore, R. C., J. F. Fisher and J. B. Chatten, colour characteristics of flying-spot signal generator, **2807**
Moore, R. P., Jr, with others, transistor oscillators, **45**
Moore, R. W., industrial applications of 'Magamps', **1095**
Morene, T., with R. L. Jepsen, f.m. distortion in reflex klystrons, **1545**
Morgan, C. G., with F. L. Jones, surface films and field emission of electrons, **3267**
Morgan, E. R., with G. R. Piercy, ferromagnetism and order in Ni-Mn alloys, **3025**
Morgan, G. D., errors in diode-valve voltmeters, **780**; h.f. discharges in gases, **1961**
Morgan, K. A., with C. F. White, dual-input parallel-T network, **3537**
Morgan, M. G., review of v.h.f. ionospheric propagation, **2422**
Morgan, S. P., Jr, theory of laminated transmission lines, **25**, **618**
Morgulis, N. D., and Ya. P. Zingerman, investigation of oxide cathode, **1527**
Morilleau, É., H. Dormont and R. Champeix, photomultipliers for counting scintillations, **2181**
—— with H. Dormont, photomultipliers and detection of nuclear particles, [illegible]
Morita, S., probe method of measuring ultrasonic field, **2195**
Moriyama, F., sunspots and magnetic storms, **2641**
—— with T. Hatanaka, characteristics of noise storms, **2971**
Morrill, C. D., and R. V. Baum, diode limiters simulate mechanical phenomena, **448**; stabilized electronic multiplier, **3643**
Morris, C. M., with K. E. Loofbourrow, stable oscillators for u.h.f. television receivers, **900**
Morris, D. W., with W. J. Bray, s.s.b. multichannel operation of s.w. radio links, **2144**
Morris, G. W., and P. G. M. Dawe, band-pass filter for 8–13 c/s, **3237**
Morris, L. H., G. H. Lovell and F. R. Dickinson, amplifiers for L3 coaxial-cable system, **3411**
Morrison, C. L., with C. A. Ludeke, analogue computer for nonlinear differential equations, **2372**
Morrison, H. J., with L. F. Deise, high-power a.f. amplifiers, **2948**
Morrow, W. E., with others, wide-band data transmitter, **3559**
Morse, E. W., with others, c.r. tubes with internal pole pieces, **257**
Morse, R. W., acoustic propagation in granular media, **923**
Morser, A. H., Sunbury portable frequency substandard for 100 c/s to 100 kc/s, **3070**
Morton, G. A., with others, two new photomultipliers for scintillation counting, **266**
Morton, J. A., present state of transistor development, **873**
Moses, H. E., application of Schwinger's variational principle to Dirac's equation of electron, **2626**
—— and Ta-You Wu, dissociation of O$_2$ in upper atmosphere, **102**
Moss, F., with others, aerial-radiation-pattern analogue computer, **3198**
Moss, H., impulse modulator, **2177**; recurrent-sweep chronograph, **3068**
Moss, T. S., interrelation between optical constants of PbTe and Si, **2017**; Photoconductivity in the Elements, (**B**)**2358**
Mostafa, A. E. S., and M. K. Gohar, determination of parameters of single-layer coils, **1922**
Mostovetch, N., electrical conductivity of very thin evaporated metal films, **3031**
Mott-Smith, H. M., change of electron temperature in electron beam, **2493**
Motz, H., W. Thon and R. N. Whitehurst, radiation by fast electron beams, **3582**
Motzo, M., interaction between e.m. waves incident vertically on the ionosphere, **2111**
Moulon, J. M., semiconductors and applications, **427**; properties and utilization of transistors, **1851**
Moussiegt, J., lattice lenses for cm waves, **1595**
Moyano Reina, F., losses in aerial feeders, **2211**
Moynihan, J. D., with R. C. Cheek, carrier-frequency noise on power lines, [illegible]
Mueller, C. W., with others, Ge *p-n-p*-junction transistor, **876**
Mühleisen, R., with A. Ehmert, high-resistance direct-voltage valve voltmeter for ±500 V, **2078**
Mullaney, F. C., design features of ERA 1101 computer, **1414**
Müller, E. W., with M. Drechsler, field electron emission of crystal surfaces, **1963**
Müller, H., comparison of double-tone and intermodulation methods of distortion measurement, **163**
Müller, J., square-wave testing of television transmission systems, **1754**; relation between transient response and picture quality, **3745**
Müller, L., architectural acoustics of Cologne broadcasting centre, **3468**
Müller, M., electron optics of long-beam amplifier valves, **2827**
Müller, R., and E. Ruch, e.m. self-oscillations in rectangular cavity with finite wall conductivity, **67**
Müller, Reinhard, radiation resistance of straight wire, **1588**; absorber for e.m. waves, **2796**; e.m. waves in circular-section cylinders, **3555**
Müller, Rolf, diffraction of guided waves, at plane diaphragms, **625**, by diaphragms with slits, **1583**, **2566**; correlation of geomagnetic M-storms with monochromatic corona, **2975**
—— and K. Westpfahl, diffraction of e.m. waves by slit, **1971**
Müller, W., Siemens u.s.w. and television transmitting valves, **1535**
Mulvey, T., 1952 conference of German Society for Electron Microscopy, **190**; magnetic circuit in electron-microscope lenses, **3385**
Mumford, A. H., with G. R. M. Garratt, history of television, **848**
Mumford, W. W., optimum piston position for wide-band coaxial-to-waveguide impedance matching, **1260**
Munakata, K., some exact solutions in nonlinear oscillations, **2622**
Muncey, R. W., with A. F. B. Nickson, acoustic-impedance measurement by transmission-characteristic method, **2868**; reverberation times of Australian concert halls, **3176**
Munford, C. M., with P. C. Clemmow, table of values of wave-theory function for complex arguments, **444**
Muniz, R., with V. Trad, theatre projection television equipment, **562**
Munro, G. H., diurnal variation of direction of travelling disturbances in ionosphere, **2309**
Munsch, M., with B. Bartels, 'conductron' photoconductive camera tube, **3128**
Murata, T., with others, propagation characteristics of obliquely incident pulse waves during solar eclipse 9th May 1948, **2770**
Murden, W. P., with A. W. Dickson, vibrating-wire high-*Q* resonator, **3561**
Murdock, C. E., with others, high-power klystrons, **1213**
Murphy, B., distributed amplifiers, **1284**
Murray, D. M., and N. L. Kusters, electromechanical a.c. line-voltage stabilizer, **3726**
Murray, R. L., and L. T. Ratner, electric fields in cyclotron dees, **1765**
Müser, H., and H. Schilling, thermoelectric measurements on Cu$_2$O, **3613**
—— with R. Caspary, photoconductivity of CdS crystals at relatively high temperatures, **1687**
—— with L. Genzel, photoelectric and optical properties of PbS layer, **2677**
Musgrave, J. R., with A. P. Thompson, production, properties and applications of Ge, **1403**
Musson-Genon, R. P., u.h.f. valves for 3-cm radar equipment, **588**
—— with J. M. Mercier, Si crystal detectors, **2190**
Myers, D. M., and W. R. Blunden, C.S.I.R.O. differential analyser, **1049**
Myers, G. T., and I. Newbiggin-Watts, television studio at 1951 Radio Exhibition, London, **564**
Myers, H. P., secondary emission from Ag and Cu films for primary-electron energies < 10eV, **1658**; varying-capacitor method for measuring contact-potential difference, **3259**

N

Nagata, T., auroral-zone currents, **2648**; solar-flare type of variation of geomagnetic field and integrated conductivity of ionosphere, **2663**, **2666**; distribution of S.C.* of magnetic storms, **2973**
—— and N. Fukushima, constitution of polar magnetic storms, **2977**
—— and T. Oguti, ionospheric storms in the auroral zone, **3293**
—— and T. Suzuki, solar-flare type of variation of geomagnetic field and integrated conductivity of ionosphere, **2664**
—— and M. Tazima, solar-flare type of variation of geomagnetic field and integrated conductivity of ionosphere, **2665**
Nagata, T., with others, anomalous ionization over auroral zone during magnetic storms, **2991**
Nail, J. J., design of discone aerials, **3196**
Nakada, I., with others, hysteresis loops of BaTiO$_3$ ceramic at h.f., **3012**
Nakata, Y., effects of solar eclipse on F regions, 9th May 1948, **2658**
—— M. Kan and H. Uyeda, frequency-sweep $h'F_2$ measurements, **3297**
Nakos, E. J., with others, debunching of electron beams contained by strong magnetic fields, **3459**
Nalot, J., with others, natural oscillations and mode changes in multi-cavity magnetrons, **1543**
Namiki, M., and K. Horiuchi, transient phenomena in waveguide, **2216**
Nankivell, J. F., method of observing selected areas in electron microscopes, **3080**
Napolin, S., with H. Fogel, cavity tuner for u.h.f. television, **1506**
Narayan, N., and K. S. Prabhu, production of standard waveforms with 3-MV impulse generator, **974**
Narita, S., Nijboer theory for BaO and co-existence of various impurity levels, **2504**; thermionic emission and electrical conductivity of oxide-coated cathodes, **3455**
Navon, D., R. Bray and H. Y. Fan, lifetime of injected carriers in Ge, **740**
Neale, D. M., with R. J. Hercock, exposure timers compensated for supply-voltage variations, **789**
Nearhoof, H. J., with others, polarization of vertically incident long radio waves, **806**
Nechleba, F., extension of concept of time constant, **2575**
Nedoluha, A., and K. M. Koch, mechanism of resistance variation in magnetic field, **377**
Néel, L., antiferromagnetism and ferrimagnetism, **1000**
Neeteson, P. A., flywheel synchronization of timebase generators, **2479**, **2480**
—— with others, ECL80 and EQ80 valves in flywheel synchronizing circuits, **2168**
Negishi, K., with Y. Torikai, phase method of visualizing ultrasonic waves, **2865**
Neuswander, R. S., with others, linear-to-logarithmic voltage converter, **3042**
Nelson, E. H., and W. A. Price, discharge lamps for television studios, **366**
Nelson, R. B., magnetrons for dielectric heating at 915 Mc/s, **2850**
Neppiras, E. A., high-frequency reciprocating drill, **2085**
Nergaard, L. S., studies of the oxide cathode, **1528**
—— with R. M. Matheson, decay and recovery of pulsed emission of oxide-coated cathodes, **285**
Nertney, R. J., model of lower E and D regions as deduced from long-wave measurements, **2306**
—— with J. J. Gibbons, wave-equation solution for ionospherically reflected long waves, (**D**)**410**, **517**
—— with others, polarization of vertically incident long radio waves, **806**; heights of ionospheric winds determined from long-wave measurements, **2311**
Nestel, W., and E. Schwartz, principles for planning of u.s.w. broadcasting systems, **2789**
Neuert, H., and H. Gutbier, counter tubes with Ar and methylene-halide filling, **1461**
—— with others, resonance in electrodeless h.f. gas discharge in magnetic field, **85**
Neugebauer, H. E. J., new method of solving diffraction problems, **1295**
Newbiggin-Watts, I., with G. T. Myers, television studio at 1951 Radio Exhibition, London, **564**
Newell, G. F., and E. W. Montroll, theory of Ising model of ferromagnetism, **2964**
Newman, H. L., with W. K. Squires, video amplifiers with optimum transient response, **3133**
Newman, M. M., R. C. Schwantes and J. R. Stahmann, aircraft radio-interference measurements, **2075**
Newton, A., push-pull amplifiers for increased video output, **3743**
Newton, G. C., Jr, compensation of feedback-control systems subject to saturation, **1135**
Newton, G. C., and H. J. B. Atkins, application of television to demonstration of surgery, **1845**
Newton, H. E., electronic tracing head for oxygen cutting, **180**
Nexon, V. J., microwave relay systems in Europe, North Africa, Near East and Australia, **3108**
N'Guyen, Thien-Chi, and J. Suchet, voltage regulators using nonlinear elements, **230**
Nickson, A. F. B., accurate measurement of a.f., **1738**
—— and R. W. Muncey, acoustic-impedance measurement by transmission-characteristic method, **2868**; reverberation times of Australian concert halls, **3176**
Nicolet, M., effects of solar radiation in upper atmosphere, **1331**; collision frequency of electrons in ionosphere, **3299**
Nicolini, L., new dielectric material, **1048**
Nielsen, R., with N. Golden, c.r.o. for display of static characteristics of transistors, **784**
Nier, A. O., with E. G. Johnson, aberrations in sector-shaped e.m. lenses, **3680**
Niesel, W., dielectric constant of heterogeneous mixtures, **1693**
Niessen, K. F., condition for vanishing spontaneous magnetization below Curie temperature, **3337**
Nifontoff, N., flicker effect in crystal detectors, **1047**, **2189**; potential barrier between electrodes of same metal, **2628**
—— and M. Perrot, resistance of imperfect contact between two metals, **3258**
—— with A. Blanc-Lapierre, properties of potential barriers, **2629**
Niimi, T., contact-p.d. changes of Ge rectifier during forming, **3260**
Nijs, L. J., test set for recording impulses, **2379**
Nikol'ski, V. S., with V. M. Lopukhin, e.m. properties of plane grating, **3588**
Nill, —, h.f. transmitters for aerodromes, **3419**
Nilsson, S. G., motion of electrons in field of toroid, **383**
Nims, P. T., design criteria for automatic controls, **2450**
Nimura, T., and Y. Watanabe, effect of finite circular baffle on sound field of disk, **1555**
Niutta, A., smallest frequency separation permissible between radio-telegraph transmissions, **540**
Nixon, R. D., monoscope, **850**
Nobiuti Ikeno. See Ikeno, Nobiuti.
Noble, D. E., commercial experience with 160-Mc/s 20-kc/s split-channel equipment, **3708**
Noble, S. W., and P. J. Baxandall, design of d.c. amplifier based on second-harmonic type of magnetic modulator, **72**
Nödtvedt, H., magnetostriction and *Δ·E* effect in Ni, **1038**
Noga, K., and S. Kawamura, photoelectric emission from BaO, **2322**
—— with others, composition of Cs-Sb photocathodes, **2824**
Nomura, Y., and T. Hatta, theory of linear aerial, **3201**
Nordby, K. S., amplifier noise particularly in a.f. range, **368**
Norde, L., network transformations, **2586**
Nordsieck, A., theory of large-signal operation of travelling-wave amplifiers, **2497**
Norton, K. A., transmission loss in radio propagation, **1111**
Noury, J., with A. Lacam, velocity of ultrasonic waves in Ar at pressures up to 950 atm, **1559**
Novak, W. D., printed multiconductor plug, **2239**
Novick, G., with others, high-power delay line for travelling-wave amplifier or oscillator, **2826**
Novosil'tsev, N. S., A. L. Khodakov and M. S. Shul'man, composition and properties of BaTiO$_3$ ceramics in strong fields, **3010**
—— with others, dielectric properties of BaTiO$_3$ single crystals, **3009**
Nowogrodzki, M., conductance measurements on operating magnetron oscillators, **157**; microwave equipment for magnetron production testing, **778**
Nuckolls, R. G., L. J. Rueger and H. Lyons, microwave absorption spectrum of NH$_3$, **2296**
—— with L. J. Rueger, Stark cell for microwave spectroscopy, **1317**
Nudelman, S., with F. Matossi, influence of electric fields on luminescence, **2283**
Nuscheler, M., evolution of electrical communication in Swiss army, **1118**
Nuttall, T. C., high-quality scanner for 35-mm film, **852**
Nutting, J., with others, conference on electron microscopy, Bristol, September 1952, **1771**
Nyborg, W. L., acoustic streaming due to attenuated plane waves, **1551**

O

Obayashi, T., characteristics of F$_2$ layer storms, **2982**
—— with H. Uyeda, field-strength calculations for long transmission paths, **2778**
Oberbeck, H., pulse distributors, **2142**
Oberdorfer, G., dimensions of magnetic quantities, **1966**
Oberhausen, E., with H. Lange, sawtooth current generator for recording of time intervals, **152**
Oberst, H., with E. Meyer, resonance-type absorbers for water-borne sound, **308**

Ochsenfeld, R., antiferromagnetism, **706**
Odell, N. H., with others, grain-boundary barriers in Ge, **1406**
O'Dwyer, J. J., and R. A. Sack, frequency dependence of dielectric properties of dipolar substances, **1647**
Oehmichen, J. P., novel valve circuits, **2600**
Oelbermann, E. J., R. E. Skipper and W. J. Leiss, moisture aging of powder-core toroids, **2355**
Oettinger, A. G., programming digital computer to learn, **1415**
Offner, G., with A. Keil, production and testing of precious-metal coatings on insulating materials, **2052**
Ogle, W. E., with R. D. England, betatron monitor and integrator, **2754**
Oguti, T., with T. Nagata, ionospheric storms in the auroral zone, **3293**
Öhman, Y., and L. O. Lodén, sunspots, flares, etc., observed at Stockholm in 1950 and 1951, **715**
Okada, J., and T. Ikegawa, resistivity of artificial graphite, **1041**
Okamura, T., T. Fujimura and M. Date, permittivity and permeability of ferrites at 6·6-cm λ, **(C)1401**
Okazaki, A., H. Tubota and H. Suzuki, temperature dependence of zero-bias resistance of Cu_2O rectifiers, **3345**
Oldekop, W., capacitance of Se rectifiers, **1802**
Olin, I. D., X-band sweep oscillator, **973**
Olive, G. A., experimental 850-Mc/s television transmitter, **566**
Oliver, F. J., with W. F. Bonner, developments in metal rectifiers, **2154**
Olivier, R., h.f. generators for aircraft v.h.f. equipment, **3240**
Olson, A. B., with others, attenuation of wire helices in dielectric supports, **1523**
Olson, H. F., J. Preston and J. C. Bleazey, uniaxial microphone, **2199**
Omar, Y. A., and C. F. Miller, characteristic impedance of rectangular coaxial transmission lines, **3474**
O'Meara, T. R., and H. D. Webb, phase and gain stabilization in matched-channel receivers, **2320**
O'Neill, B. J., and A. Gutterman, equipment for transistor testing, **3053**
O'Neill, H. F., and L. L. Bailin, effects of dimensional errors on performance of linear shunt-slot arrays, **1592**
O'Neill, R., H. M. Thaxton and S. Cutler, autocorrelation function from ergodic hypothesis, **535**
—— with others, application of ergodic hypothesis in calculating autocorrelation function of teleprinter signals, **537**
Onishi, T., with M. Kikuchi, investigations of electrical forming of Ge rectifiers, **2032**
Opfer, G., with others, remanence in soft-iron circuits of magnetic electron lenses, **2102**
Oppitz, H., determination of linear quadripoles for cm λ, **1733**
Orchard, H. J., formulae for ladder filters, **666**
Ordung, P. F., and others, 3-terminal *RC* networks, cascaded, synthesis of, **656**, paralleled, synthesis of, **3536**
Ortusi, M., tropospheric propagation and analogies in wave mechanics, **2112**
Osborne, B. W., electron content of F_2 region below level of maximum ionization, **1349**
Osborne, F. J. F., activation of BeCu multipliers, **1517**
Osborne, M. F. M., number theory and magnetic properties of electron gas, **991**
Osche, R. A., developments in fixed resistors, **946**
Oser, E. A., R. O. Endres, and R. P. Moore, Jr, transistor oscillators, **45**
Osmond, W. P., magnetic properties of iron-oxide powders, **2338**
Ossaka, J., with Y. Kato, variation of geomagnetic field during bay disturbances, **2972**
Ostrow, S. M., and M. PoKempner, ionospheric critical frequencies and sunspot number, **1350**
Oswald, J., theory of antimetrical lattice filters, **2597**
Ota, M., recurrence tendency of magnetic storms, **2974**
Otpushchennikov, N. F., velocity of ultrasonic waves in solids, **1225**
Otte, J., with others, effects due to curvature of valve characteristics, **1854**
Ouchi, S., with others, attenuation characteristics for h.f. and m.f. waves, and application to field-strength calculations, **2774**
van Overbeek, A. J. W. M., and F. H. Stieltjes, bandwidth limit of junction transistors, **3747**
—— J. L. H. Jonker and K. Rodenhuis, decade tube for high counting rates, **3762**
Overhoff, G., programme-controlled computers in Germany, **1725**
Overton, B. R., with others, television valves and a.c./d.c. receivers, **1503**
Owen, F. C., and A. B. Ewen, transmitter drive unit for s.s.b. multichannel operation of s.w. radio links, **2175**
Owens, C. D., analysis of measurements on magnetic ferrites, **1707**
Owens, H. L., with A. Coblenz, temperature variation of transistor parameters, **883**; theory and applications of transistors, **1957, 2289, 2627, 3021, 3444, 3523**
Oxford, A. J., pulse-code modulation systems, **3106**

P

Packard, K. S., automatic Smith-chart plotter, **3065**
Packer, L., and W. J. Wray, Jr, Ge photodiodes read computer tapes, **454**
Padel, S. H., A. R. A. Rendall and S. N. Watson, test equipment for television transmission circuits, **1823**
Paetzold, H. K., vertical distribution of ozone, **2649**
Page, R. M., A. Brodzinsky and R. R. Zirm, microwave correlator, **1067**
Paivinen, J. O., and I. L. Auerbach, design of triode flip-flops for long-term stability, **3558**
Pakala, W. E., with others, radio interference tests in field and laboratory, **2431**
Pakswer, S., and R. Meyer, arc drop and deionization time in inert-gas thyratrons, **3154**
Paling, A. W. M., television transmission of Coronation ceremonies, **3118**
Palmer, L. S., dielectric constant of water in wet clay, **99**
—— A. Cunliffe and J. M. Hough, dielectric constant of water films, **1040**
Palmer, R. B. J., thermoelectric method for comparing ultrasonic field intensities, **3171**
Pan, Wen Yuan, one-channel converter for u.h.f. television, **861**
Panasyuk, E. I., with others, thermoluminescence of sulphate-base materials, **3006**
Panchenko, V. G., with S. B. Gurevich, ferroelectric materials, **1373**
Pancholy, M., with others, harmonic oscillations of quartz plates, **1619**
Panesenkov, F. F., magnetization of toroids with one and two air-gaps, **2584**
Pankove, J. I., and others, use of flying-spot scanner to study photosensitive surfaces, **890**
—— with others, Ge *p-n-p*-junction transistor, **876**
Pannenborg, A. E., scattering matrix of symmetrical waveguide junctions, **66**
Pantchechnikoff, J. I. See Pankove, J. I.
Panzer, S., h.f. h.v. equipment for electron microscope with intermediate accelerator, **2103**
Paolini, E., spontaneous voltage fluctuations in resonant circuit, **676**
Papas, C. H., and W. W. Salisbury, magneto-hydrodynamic waves in conducting liquids, **1661**
Parbrook, H. D., ultrasonic interferometer for high fluid pressure, **2542**
Parent, R. J., graphical analysis for circuits including overdriven valves, **356**
—— with R. J. Medkeff, diode-bridge limiter for analogue computers, **2367**
Parker, G. M., with R. W. Williams, source of continuously variable voltage for computer, **1066**
Parker, R., magnetoresistance of Al-Si-Fe alloys, **125**
Parkin, P. H., and W. A. Allen, acoustic design of auditoria, **3175**
—— and others, acoustics of Royal Festival Hall, **2198**
Parmenter, R. H., acousto-electric effect, **2281**
Parr, J. C., matching discontinuities in waveguides, **3477**
Parry, C. A., band-spreading for communication receivers, **812**
Parthasarathy, S., S. S. Chari and D. Srinivasan, dependence of sonic intensity at source on absorption coefficient in liquids, **2543**
—— M. Pancholy and A. F. Chhapgar, harmonic oscillations of quartz plates, **1619**
Partington, D. K., with J. C. West, phase-shifting pulse generator for thyratron control, **1629**
Parton, J. E., network analysis by repeated voltage superposition, **655**
Parzen, P., space-charge-wave propagation in electron beam, **268, 3450**; effect of thermal-velocity spread on noise figure of travelling-wave valve, **3452**
—— with others, low-noise travelling-wave valve, **273, (C)2496**
Pask, J. A., with others, fundamentals of glass-to-metal bonding, **2712**
Patchett, G. N., television waveform display apparatus, **2745**
Patmore, J., with others, digital-to-analogue converter, **148**
Patton, R. G., and F. [illegible] ultrasonic applications in metal [illegible] industry, **493**
Paul, F. A., [illegible] resistor temperature coefficients, **1921**
Paul, W., and R. V. Jones, absorption spectra of PbS at various temperatures, **2020**
Pauli, R. T., with C. Mileikowsky, 1·5-MV accelerator for heavy particles, [illegible]
Pauling, L., theory of ferromagnetism, **3586**
Paulsen, E., serrasoid modulation, **1846**
Pauthenet, R., spontaneous magnetization of ferrites, **1397**
Pavel, E. A., and H. v. Schau, tests on star-quad broadcast-programme cable without loading coils, **1578**
Payne, D. V., distributed amplifier theory, **2612**
Payne, W. T., spinor theory of quadripole networks, **3226**
Peachey, F. A., R. Toombs and C. Gunn-Russell, B.B.C. monitoring technique for unattended transmitters, **548**
Pearce, A. F., and B. J. Mayo, Type-R5081 reflex klystron oscillator for f.m. at cm λ, **1214**
Pearcey, T., with M. Beard, electronic computer, **1050**
Pearson, G. L., and B. Sawyer, Si *p-n*-junction diodes, **905**
—— and M. Tanenbaum, magnetoresistance effect in InSb, **2696**
Pearson, M. D., with others, reflection of microwaves by metal-plate structures, **389**; compressional phase shifter for microwave measurements, **1440**
Pearson, R. M., and F. A. Benson, direct-reading thermistor bridge, **1749, (D)2740, (D)3366**
Peck, D. S., decade cold-cathode counter tube, **1867**
Peddie, E. A. R., applications of cold-cathode gas-discharge tubes in electronic switching, **288**
Pederson, C. N., A. A. Gerlach and R. E. Zenner, electronic function generator, **451**
Peelle, R. W., with K. G. Standing, improvement of resolution of scintillation counters, **2107**
Peifer, A. G., P. Parzen and J. H. Bryant, low-noise travelling-wave valve, **273, (C)2496**
Pell, E. M., Hall effect in BaO single crystals, **129**; recombination rate in Ge, **2692**
—— and R. L. Sproull, recording a.c.-Hall-effect apparatus, **1057**
Pelz, F. M., realizability conditions for series-parallel matrix of reactance quadripoles, **3225**; design of symmetrical bridge-type filters, **3235**
Penin, F., and G. Phélizon, distance-measuring equipment, **3315**
Pennell, E. S., vitreous silica for ultrasonic delay lines, **3637**
Penner, D. I., visual observation of radiation from waveguides, **1231**
Peoples, S. R., with others, reflection of microwaves by metal-plate structures, **389**; compressional phase shifter for microwave measurements, **1440**
Pepinsky, R., with B. C. Frazer, X-ray analysis of ferroelectric transition in KH_2PO_4, **2048**
Pepperhoff, W., electron emission from cold-worked metals, **1390**
Pepping, F., with M. Finck, radio communication on German railways, **210**
Percival, W. S., factors in design of wide-band television amplifiers, **1838**; solution of passive networks by mathematical 'trees', **2587**
Perers, O. F., B. K. E. Stjernberg and S. K. H. Forsgren, microwave propagation in optical range, **3097**
—— with S. K. H. Forsgren, recording of rain by radar, **2994**
Perets, V. B., with others, coercive force of nonuniformly magnetized specimens, **3024**
Peretz, R., measurement of effective values of welding currents, **194**
Pérez, J. P., and P. Johannin, piezoelectric resonance of quartz up to 5 000 atm, **442**
Perilhou, P., and J. Cayzac, stabilized h.v. rectifier unit for 5 kV, 50 mA, **2800**
Perlmutter, A., with others, induced conductivity of luminescent powders, **2021**
Pernik, J., recent developments in dry cells, **3727**
de la Perrelle, E. T., with F. L. Jones, field emission of electrons in discharges, **1962**
Perrier, A. L., transverse magnetogalvanic effects and resistivity, **1319**
Perron, R. R., contour recording by magnetic tape, **1449**
Perrot, M., and J. P. David, deviations from Ohm's law in thin metal layers, **2685**
—— with N. Nifontoff, resistance of imperfect contact between two metals, **3258**
Persoon, A. H., magnetic striping by laminating process, **2207**
Peter, M., with others, properties of very small ferroelectric particles, **3007**
Peter, R. W., low-noise travelling-wave amplifiers, **277**
—— J. A. Ruetz and A. B. Olson, attenuation of wire helices in dielectric supports, **1523**
—— with others, developments in travelling-wave valves, **1524**
Peters, J., significance of complex frequencies in communications technology, **657**; reduction of carrier-frequency build-up process to l.f. process, **1249**
—— with W. Händler, calculation of transients in carrier-current systems, **2246**
Peterson, A., and D. B. Sinclair, single-ended push-pull a.f. amplifier, **3250**
Peterson, A. M., with O. G. Villard, Jr, scatter sounding, a new ionospheric technique, **201**; extended-range communication in 15- and 20-m bands, **2421**
—— with others, double-Doppler investigation of meteor-trail echoes, **393**; transmission by reflection from meteoric ionization, **2117**
Peterson, D. W., with J. Epstein, field-strength surveys for u.h.f. television, **523**; experimental study of wave propagation at 850 Mc/s, **2423**
Peterson, H. A., with P. E. Russell, harmonic power generation with nonlinear reactor, **2455**
Petritz, R. L., theory of noise, in contacts, **79**, in *p-n* junctions and related devices, **871**
Petruzzelli, R. T., high-quality television unit for p.p.i. display, **2001**
Peuteman, A., precise determination of time interval, **1420**
Pfann, W. G., with others, observations of dislocations in Ge boundaries, **2593**
Pfister, W., magneto-ionic multiple splitting determined by phase-integration method, **2114**
Phélizon, G., with F. Penin, distance-measuring equipment, **3315**
Philipp, H. R., with I. L. Sparks, retarding-potential method for measuring conductivity of oxide-coated cathodes, **2835**
Phillips, A. H., and M. Cooperstein, modulation index of f.m. signals, **3071**
Phillips, E. T. A., with others, recent developments in phototelegraphy and facsimile transmission, **557**
Phillips, G. J., influence of ionosphere on m.f. broadcasting, **3096**
Phillips, W. E., automatically calibrated electronic frequency recorder, **2377**; high-speed telemetry system, **3674**
Picard, E., and A. Rogozinski, limitation of discharge propagation in G-M counters, **3390**
Piccardi, G., and R. Cini, potential in electrically shielded space, **1646**
Pick, H., with H. Mette, electronic conductivity of anthracene single crystals, **3016**
Pickens, D. H., analogue computer, **3043**
Piddington, J. H., thermal theories of high-intensity components of solar r.f. radiation, **1980**
Piefke, G., exponential transmission line and its radiation loss, **3187**
—— with others, h.f. equipment for 24-channel p.p.m. beam R/T system, **822**
Piepgras, E., square-wave generator, **2944**
Pierce, E. T., with F. Hepburn, atmospherics with very-low-frequency components, **2771**
Pierce, J. R., calculation of microwave noise in electron streams, **891**
Pierce, R. W., with W. P. Senett, stabilized power supply for electrometer valves, **1133**
Piercy, G. R., and E. R. Morgan, ferromagnetism and order in Ni-Mn alloys, **3025**
Pietermaat, F. P., and R. Antoine, h.f. tempering of band-saw teeth, **179**
Piggott, W. R., abnormalities in ionosphere at high latitudes, **1672**; reflection and absorption of radio waves in ionosphere, **1679**
—— with E. V. Appleton, ionospheric storms and geomagnetic anomaly in F_2 layer, **2308**
Pike, E. W., design of optimum filters, **2924**
Pikus, G. E., influence of electronic surface states on optical properties of semiconductors and dielectrics, **1304**
Pilod, P., with M. Laudet, potential distribution in e.s. electron lens, **3383**
Pimonow, L., [illegible], **1885**
Pincherle, L., with others, electronic band structure of PbS, **2937**
Pinet, A., experimental 12-channel p.c.m. system, **1125**
Pipes, L. A., mathematical analysis of dielectric amplifier, **70**; parallel-connected magnetic amplifiers, with resistive load, **(D)944**, with inductive load, **1251**; analysis of idealized series-connected magnetic amplifier, **3508**; matrix solution of Mathieu-Hill type equations, **3640**
Pippard, A. B., and R. G. Chambers, mean free path of conduction electrons in Bi, **996**
Pittman, G. F., Jr, with L. A. Finzi, comparison of methods of analysis of magnetic amplifiers, **2910**
—— with others, effective feedback ratio of magnetic amplifiers, **3510**
Plach, D. J., and P. B. Williams, horn-loaded loudspeakers, **314**
Plottin, G., with others, 3 signal-generators covering range 20-1200 Mc/s, **1084**
Poeverlein, H., ionosphere critical frequencies for oblique incidence, **2115**
Poganski, S., blocking mechanism of Se rectifiers, **2699**
Pohlit, W., with W. Lippert, electron-optical properties of e.s. lenses, **795**
Poincelot, P., nonexistence of Sommerfeld's surface wave, **195, 3686**; transient response of filters and transmission lines, **1248**; concept of instantaneous frequency, **2908**; extension of Fermat's principle to group propagation time, **3592**
PoKempner, M., with S. M. Ostrow, ionospheric critical frequencies and sunspot number, **1350**
Pokrovski, Ya. E., with S. G. Kalashnikov, influence of surface on type of conduction of semiconductor, **2686**
van der Pol, B., radio technology and theory of numbers, **3346**
Poleck, H., balance approach in a.c. bridges, **1434**
Polgreen, G. R., production and application of magnetic powders, **762**
Pollack, I., effect of frequency and amplitude distortion on speech intelligibility, **10**
Polovin, R. V., with A. I. Akhiezer, plasma oscillations in crossed electric and magnetic fields, **3591**
Ponthus, A., with G. Comte, measurements of attenuation of TE_{01} waves in circular waveguide, **1068**; determination of characteristic impedance of coaxial cables, **2732**
Pope, G. J., constant-volume amplifier, **365, (D)686**
Poritsky, H., electron-gas equations for electron flow in diodes, **1863**
—— and R. P. Jerrard, integrable case of electron motion in electric and magnetic field, **76**
Porter, J. H., speed-sensing relay, **499**
Porter, W. C., and W. E. Ramsey, circuit for limiting discharge in G-M counters, **73**
Portier, —, organization of civil aviation, **3419**
Portis, A. M., and others, electron-spin resonance in Si semiconductor, **3342**
Post, E. J., acoustic radiation pressure and dispersion, **1565**
Potter, J. L., with others, ratio meter measures reflection coefficient, **466**
Pottier, J., and A. Lavaitte, current and voltage regulators, **3725**
Pottinger, R. F. A., problems of sound in television programmes, **846**
Potts, J., with J. C. West, relation between closed-loop transient response and open-loop frequency response, **3231**
Poulis, N. J., and G. E. G. Hardeman, temperature dependence of spontaneous magnetization of antiferromagnetic single crystal, **[illegible]36**
Pourciau, L. L., television camera equipment, **2164**
Powell, F. H., with others, c.r. tubes and valves for television receivers, **1521**
Powell, R. C., simplified method for measuring attenuation of balanced transmission lines, **467**
Powell, R. M., radiation resistance of small horizontal loop aerial, **327**
Power, B. D., with others, working fluids for diffusion pumps, **1686**
Powers, R. L., with others, magnetic striping techniques, **2206**
Prabhu, K. S., with N. Narayan, production of standard waveforms with 3-MV impulse generator, **974**
Prache, P. M., a.c. resistance and reactance of round conductors, **1918**; primary parameters of uniform cable circuits, **2556**
—— and H. Billottet, magnetodynamics of ferrites, **1029**
Prache, P., with P. Tavernier, effect of pressure on resistance of thermistor, **342**
Pramanik, S. K., secular variation of geomagnetic field at Colaba and Alibag, **399**
Prast, G., Jr, with D. van Zoonen, properties of Ar-Br-filled counters, **1463**
Praxmarer, W., possibility of generating mm waves with pulsed rising-sun magnetron, **297**
Prechner, L. J., with T. W. Bennington, B.B.C. ionospheric-storm-warning system, **193**
Preist, D. H., C. E. Murdock and J. J. Woerner, high-power klystrons, **1213**
Presnov, V. A., relation between h.v. polarization of dielectrics and intensity of electric field, **2681**
Pressey, B. G., G. E. Ashwell and C. S. Fowler, measurement of phase velocity of 127·5-kc/s ground wave, **1782**
—— C. S. Fowler and R. W. Mason, precision phase comparator for l.f., **(A)483, 1080**
—— with others, ionospheric propagation of v.l.f., l.f. and m.f. waves, **1781**
Pressler, H., European broadcasting conference, Stockholm, 1952, **534**
Pressman, R., design of bistable multivibrators, **1946**
Preston, G. W., statistical equivalence of optimum transducers, **3700**
—— and J. C. Tellier, lock-in performance of a.f.c. circuit, **1280**
Preston, J., WJZ-TV emergency aerial system on Empire State Building, [illegible]
—— with others, uniaxial microphone, **2199**
Preston, J. G., measurement of television field strengths by helicopter, **576**
Price, R. E., travelling disturbances in ionosphere, **3294**
Price, T. W., with others, c.r. tubes and valves for television receivers, **1521**
Price, W. A., and E. H. Nelson, discharge lamps for television studios, [illegible]
Prichard, A. C., and M. Bernstein, impedance meters for crystal units, **2390**
Prim, R. C., field distribution in a 'swept intrinsic' semiconductor, **2689**
—— with W. Shockley, space-charge-limited emission in semiconductors, **3324**
Prime, H. A., Hg-vapour discharge, microwave admittance of, **1654**, absorption and reflection of microwaves by, **1656**
Prince, M. B., relation between pulse and charge-carrier drift mobilities in Ge, **3617**
—— with F. S. Goucher, current amplification factor for *p-n*-junction transistors, **2488**
Prins, J. A., J. Schenk and J. M. Dumoré, temperature distribution at end of hot wire, **283**
Pritchard, D. H., and R. N. Rhodes, colour-television-signal demodulators, **3438**
Pritchard, R. L., junction-type transistors, frequency variation of current gain for, **690**, collector-base impedance of, **(D)3212**
Pritsching, L., with K. Tamm, frequency analyser with mechanical filter, **1227**
Prowse, W. A., and P. E. Lane, u.h.f. breakdown of gas in crossed electric fields, [illegible]
Prugne, —, and P. Garin, use of membranes in vacuum technique, **110**
Prugne, P., and P. Léger, uniform metallization of surfaces by thermal evaporation, **428**
Pryce, M. H. L., diffraction of radio waves by curvature of earth, **1776**
Przedpelski, A., with others, double-counter discriminator, **684**
Pugh, E. M., with S. Foner, Hall effect of Co-Ni alloys and armco iron, **3625**
Pungs, L., and G. Meinshausen, magnetic demodulation, **3400**
Purkis, H. J., with others, acoustics of Royal Festival Hall, **2198**
Püschel, B., voltage measurements on Rochelle salt under pressure, **735**
Putley, E. H., conductivity and Hall coefficient of sintered PbS, **120**; thermo- and galvano-magnetic coefficients for semiconductors, **1380**; intrinsic conduction in PbS, PbSe, PbTe, **1388**

Q

Quiquandon, —, and — Lalmi, central telecommunications office for civil aviation, **3418**

R

Raabe, H. P., graphical spectrum analyser for pulse series, **3641**
Rabinow, J., notched-disk pulse-storage device, **494**
Raburn, L. E., f.m.-altimeter slot radiators, **2897**
"Radionyme", compressed television, **1824**
Rado, G. T., permeability tensor and Faraday effect in nonsaturated ferromagnetic materials, **1709**
—— and others, properties of ferrites at v.h.f., **1312**
Ragazzini, J. R., and L. A. Zadeh, analysis of sampled-data control systems, **(A)1801**
—— with L. A. Zadeh, optimum filters for detection of signals in noise, **205**
Rahman, A., accuracy of perturbation calculated from inaccurate unperturbed wave function, **3254**
Raithby, C. B., converter for 200 kc/s, **3688**

Rajchman, J. A., matrix digit-storage systems, **1726**
Ralston, R. W., and B. D. Wickline, television coverage of the 1952 National Political Conventions, **3134**
Ramberg, E. G., and L. Malter, potential distribution between accelerating grid and parallel anode, **1534**
Ramer, L. G., with others, reverberation-room measurements of loudspeaker efficiency, **2873**
Ramey, R. A., magnetic amplifier, single-core, as computer element, **3048**, mechanics of operation of, **3503**, control of, **3507**
Ramsay, J. F., with others, B.B.C. television transmitting aerials, **934**
Ramsey, W. E., with W. C. Porter, circuit for limiting discharge in G-M counters, **73**
Ranc, G., thin metal films, **430**
Rand, P. S., reduction of radiation from television receivers, **2476**
Randall, J. E., with H. M. Hines, possible dangers in industrial use of microwave radiation, **1093**
Rank, D. H., and D. C. Cronemeyer, infrared absorption of heat-treated Ge, **2678**
—— R. P. Ruth and K. L. Vander Sluis, determination of velocity of light by band-spectrum method, **987**
Rao, B. R., and K. S. Rao, measurement of ultrasonic velocities in liquids, **2859**
Rao, K. S., with B. R. Rao, measurement of ultrasonic velocities in liquids, **2859**
Raoult, G., and R. Fanguin, frequency-stabilized u.h.f. discriminator, **2386**
—— and R. Turlier, u.h.f. oscillations in triode valves, **2271**
Rappaport, W., with G. Boré, suitability of 'fixed level' recording method for propagation research, **2065**
Rasch, R., noise measurements on television transmissions, **868**
Raschkowitsch, A., spectral differences between a.m. and f.m. oscillations, **2484**; diode modulator for f.m., **2485**
Ratcliff, G., with J. B. Jenkins, automatic measurement of ionospheric absorption of vertical-incidence pulse signals, **1680**, **(D)3305**
Ratcliffe, J. A., with M. Ryle, radio astronomy, **92**
Ratcliffe, P. M., microwave noise generators, **788**
Rathenau, G. W., J. Smit and A. L. Stuyts, ferromagnetic properties of ferroxdure materials, **751**
—— with others, preferred crystal orientation in ferromagnetic ceramics, **1036**
Ratner, L. T., with R. L. Murray, electric fields in cyclotron dees, **1765**
Ratz, A. G., and V. G. Smith, gating method for parallel computers, **2374**
Rau, K. H., with W. Hanle, light emission and destruction of phosphors by electron and ion impact, **734**
Rau, K. L., new thyratrons for telephone-circuit engineering, **3156**
von Rautenfeld, F., and H. W. Fastert, problems of u.s.w. coverage, **2139**
Rawer, K., calculation of sky-wave field strength, **199**; longitude effect in F region, **(D)2307**
—— with E. Harnischmacher, radio links covering very great distances, **525**
—— with others, effect of geomagnetic field on ionospheric absorption of short waves, **1678**
Raymond, F., electrical and mechanical analogies, **989**
Raymond, F. H., stability of multiple linear servo-system, **227**
Rayner, G. H., selective detector amplifier for 10 c/s–10 kc/s, **1633**
Raynor, G. V., band structure of metals, **2046**
Read, W. T., Jr, with W. Shockley, statistics of recombination of holes and electrons, **420**
Reboux, J., bibliography on h.f. induction heating, **3676**
Reche, K., progress in teleprinter technique, **2138**
Reddan, M. J., and G. F. Rouse, clean-up of He in arc discharge, **3604**
Reder, F., and E. Hafner, method of determining dielectric constants of fluids at cm λ, **1734**
Rediker, R. H., with others, phase-bistable transistor circuit, **3515**
Redington, R. W., diffusion of Ba in BaO, **432**
Reed, E. D., frequency-sweep method of *Q* measurement for single-ended resonators, **465**; coupled-resonator reflex klystron, **3160**
Reed, I. S., with others, phase-bistable transistor circuit, **3515**
Reed, J. R., with W. J. Renwick, silicone resins in insulation at power frequencies, **2352**
Reed, M., A. B. Atkinson and D. S. Clarke, factors affecting design of mass-production television receivers, **1496**
Reed, R., with others, conference on electron miscrocopy, Bristol, Sept. 1952, **1771**
Reed, R. H., modified magic-T phase shifter, **331**
Reeves, R. J. D., feedback-amplifier design, **983**
Reggia, F., u.h.f. magnetic attenuator, **1937**
—— and R. W. Beatty, u.h.f. magnetic attenuator, **964**
Rehman, I., E. Singer and C. S. Szegho, rotating-screen colour-television tube, **3740**
Reich, E., and P. Swerling, detection of sine wave in Gaussian noise, **2429**
Reich, H. J., admittance diagrams in oscillator analysis, **1944**
Reichardt, W., and I. Broser, effect of pounding on luminescence of ZnS phosphors, **2022**
Reichel, W., comparative survey of input stages of television receivers, **1167**
Reiches, S. L., with others, c.r. tubes with internal pole pieces, **257**
Reilley, E. M., R. S. Bender and H. J. Hausman, r.f. power supply, **1134**
Reina, F. Moyano. See Moyano Reina, F.
Reintjes, J. F., analogue electronic correlator, **453**
—— with M. J. Levin, 5-channel analogue correlator, **2366**, **2720**
Reitan, D. K., with T. J. Higgins, capacitance calculation for circular annulus by subarea method, **2302**
Rekalova, G. I., optical and photoelectric properties of orpiment, **415**
Renaudin, D., brush-discharge ionization in dielectrics, **136**
Rendall, A. R. A., and W. N. Anderson, temporary links for television outside broadcasting, **1143**
—— and G. A. Hunt, transmitter combining circuits, **870**
—— with others, test equipment for television transmission circuits, **1823**
Renwick, W. J., and J. R. Reed, silicone resins in insulation at power frequencies, **2352**
Resegotti, L., inductive waveguide attenuator, **2599**
Reule, A., emission from solar corona at λ 10 cm–10 m, **3277**
Reuterswärd, C., two-directional focusing with short uniform magnetic fields, **175**
Reynolds, D. C., with others, single synthetic CdS crystals, **135**
Reynolds, F. W., and G. R. Stilwell, mean free paths of electrons in evaporated Cu and Ag films, **714**
Reynolds, J. H., isotopic constitution of Si, Ge and Hf, **3341**
Reynolds, L. G., errors of Decca navigator system used over land, **1025**
Reza, F., theorems on 2-terminal networks, **3532**
Rezanov, A. I., thermal and thermoelectric properties of ferromagnetic metals, **1394**
Rhodes, D. R., optimum linear array for single main beam, **2571**
Rhodes, R. N., with D. H. Pritchard, colour-television-signal demodulators, **3436**
Riblet, H. J., synthesis of narrow-band direct coupled filters, **58**, **(D)3234**
Rice, P. L., W. V. Mansfield and J. W. Herbstreit, ground-to-air cochannel interference at 2·9 kMc/s, **1793**
Rice, S. O., statistics of field-strength fluctuations far beyond horizon, **1473**
Richards, [illegible], equipment for observation of very high-speed phenomena, **1763**
Richardson, E. G., acoustics in relation to radio engineering, **911**
Richardson, H. K., 1952 Audio Fair, **1218**
Richardson, W. D., Northern England television outside broadcasts, **560**
Richman, D., frame synchronization for colour television, **236**
Rideout, V. C., with H. Chang, generalization of modulation spectra, **2790**
Rider, G. C., v.h.f. experiments on diffraction effects of hills, **3091**
Ridout, M. S., potential barrier height in barrier-layer cells, **1852**
Rieke, J. W., and R. S. Graham, television terminals for L3 coaxial-cable system, **3424**
Rieth, H. F., compact u.h.f. television tuner, **571**
Riety, P., electronic antiresonant circuit, **2591**
Righini, G., and G. Godoli, solar influence in gyro interaction experiments, **3693**
Rimai, E., with F. Assadourian, theory of microstrip transmission lines, **822**, **2213**
Ringer, K., with others, double-counter discriminator, **684**
Ritchie, E. J., addition agents for negative plates of Pb-acid storage batteries, **2157**
Ritson, F. J. U., and P. H. Hammond, electronic simulator for hydraulic servomechanism, **1054**
Rittenhouse, J. W., cathode-drift compensation in d.c. amplifiers, **(A)2617**
Ritterman, M. B., autocorrelation theory and television video signal, **3121**, **3122**
Rivkin, S. M. See Ryvkin, S. M.
Robbins, H., with others, magnetic striping techniques, **2206**
Robeer, A. G., 100-kW s.w. broadcasting transmitter, **2819**
Roberson, R. E., iterative method for nonlinear vibrations, **3571**
Roberts, A., Jr, with others, magnetic striping techniques, **2206**
Roberts, E. A., and P. Goldsmith, piezoelectric crystals for pressure, temperature and humidity measurements, **2403**
Roberts, F., and J. Z. Young, flying-spot microscope, **1759**
—— J. Z. Young and D. Causley, flying-spot microscope, **3073**
Roberts, F. F., with others, structure and properties of ferrites, **2043**
Roberts, N. F., and L. T. Wilson, counting pulses of various forms and occurrence intervals, **1257**
Roberts, S., electroluminescent powders in dielectric media, **3575**, **3576**
Roberts, T. E., Jr, theory of single-wire transmission line, **1580**
Roberts, V., and A. S. Young, PbSe photoconductive cells in infrared spectroscopy, **3142**
—— with D. A. H. Brown, high-speed infrared spectrometer, **1758**
Roberts, W. van B., ferrite magnetostrictive resonators, **2229**
Robin, L., autocorrelation function and power-density spectrum of clipped thermal noise, **532**; calculation of harmonic distortion in f.m. or ph.m., **1282**; optimum clipping for pulse signal with superposed thermal noise, **2781**
Robinson, A. A., multiplication in Manchester University computer, **1051**
Robinson, H. L., diffraction patterns in circular apertures of diameter < λ, **1666**
Robinson, N. P., with I. C. Browne, cross-polarization of radar melting-band, **1364**
Robinson, T. S., transformers for infrared chopped-beam systems, **942**
Roch, R., and J. A. Ville, transmission parameters of a cable amplification section, **2559**
Roche, A. H., and L. E. Weaver, television frequency-translating terminal equipment for the Birmingham/Holme-Moss coaxial cable, **1149**
Rochelle, R. W., c.r-tube beam intensifier, **162**
Rockett F. H., Jr, with E. G. Fubini, bandwidth of λ/4 sections, **30**
Rockstuhl, F. G. R., analysis of fundamental and harmonic crystal-oscillator circuits, **358**
Rodenhuis, K., with others, decade tube for high counting rates, **3762**
Rodina, E. A., with others, single-electrode discharge at 31·7 Mc/s, **1307**
Rodnikova, I. V., with V. M. Kel'man, motion of charged particles in e.m. field of linear current and e.s. field of cylindrical capacitor, **75**
Roessler, E., special type of p.m. for transmission of radar pictures, 'Durchmusterung', **2002**
Rogers, A. W., and B. A. Diebold, components and materials for reliable electronic equipment, **2261**
Rogers, D. C., travelling-wave valve as output amplifier in cm-λ radio links, **2829**
—— and P. F. C. Burke, British television relay uses travelling-wave valves, **2830**
Rogers, T. H., rectifier valve for extremely high power and voltage levels, **2155**
Rogozinski, A., with E. Picard, limitation of discharge propagation in G-M counters, **3390**
Rohan, P., use of short transmission lines in u.h.f. techniques, **2917**
Rohmer, R., with others, lattice defects and Debye r.f. absorption in iron oxides, **2328**, **(C)3612**
Roka, E. G., C. H. Jackson and R. P. Ulrich, evaporated-point-contact rectifiers, **2179**
Rollin, B. V., and E. L. Simmons, infrared photoconductivity of Si at low temperatures, **2014**
—— and I. M. Templeton, noise in semiconductors at v.l.f., **2039**
Romand, J., R. Aumont and B. Vodar, variation of resistance of thin metal films as function of applied potential, **3339**
—— with R. Aumont, precision measurement of direct voltages by comparison, **2726**
Romanowski, M., bridge method for absolute determination of ohm, **1426**
Ronchi, L., and G. Toraldo di Francia, determination of reflection coefficient of stratified medium by calculus of variations, **1314**
Rooksby, H. P., with B. T. M. Willis, crystal structure and antiferromagnetism in haematite, **1311**
Roos, W., auxiliary circuits in studio, **223**
van Roosbroeck, W., large current amplifications in filamentary transistors, **1516**; transport of added current carriers in homogeneous semiconductor, **3611**
Roques, P., adaptation of French télevision receivers to American standards, **2471**
Rorden, H. L., and R. S. Gens, radio noise in relation to design of h.v. transmission lines, **927**
Rose, D. J., and S. C. Brown, admittance and electron density of h.f. gas discharge, **463**
Rose, G. M., and B. N. Slade, transistors operate at 300 Mc/s, **585**
Rosen, J., with others, evaporation of Ge films from carbon crucible, **3032**
Rosenthal, J. E., with A. Bramley, field-dependent luminescence of vitreous Zn_2SiO_4 phosphor, **418**
Rosenthal, L., resistive bidirectional coupler, **2592**
Rosenthal, L A., J. L. Potter and G. M. Badoyannis, ratio meter measures reflection coefficient, **466**
Ross, G. I., with L. E. Tagholm, selection and testing of sites for television transmitters in United Kingdom, **1172**
Ross, H. A., design of single-phase transductors, **1254**
Ross, I. M., with G. C. Dacey, unipolar field-effect transistor, **3445**
Rossetti, C., interferometer measurements on ultrasonic waves, **1223**
Rostoker, N., interpretation of experiment on metals with positive Hall coefficient, **1300**
Roth, L., and W. E. Taylor, preparation of Ge single crystals, **744**, **(C)1408**
Rothe, H., limiting sensitivity of triode amplifying valves, **1203**; circuit and valves for u.s.w. receivers, **2428**
—— and E. Willwacher, limiting sensitivity of amplifier valves, **1538**
—— W. Dahlke and J. Schubert, measurement of flicker-effect constants, **2725**
Rothen, F., Swiss radio communication and broadcasting organizations, **1123**
Rottgardt, K. H. J., luminescence decrease due to electron irradiation, **3322**
Rouault, C. L., and G. N. Hall, h.v. medium-power *p-n*-junction rectifier, **835**
Roubine, É., guiding of e.m. waves by helices, **388**
Round, H. J., magnetostriction transducer measurements, **5**
Rouse, G. F., with M. J. Reddan, clean-up of He in arc discharge, **3604**
Rousseau, J., radio components exhibition, Paris, 1953, **2282**
Roux, J., photodielectric effect, ferroelectricity and thermoluminescence of ZnO under u.v. irradiation, **3005**
Rowe, E. G., technique of reliable valves, **272**
Rowe, H. E., noise analysis of a single-velocity electron gun, **1848**
Rowlands, R. O., harmonic distortion and negative feedback, **2278**, **(D)3253**, **(D)3568**
Roy, R., with B. M Banerjee, high-precision ionosphere-sounding equipment, **1677**
Roys, H. E., distortion in phonograph reproduction, **2736**
Rubinoff, M., design of Eccles-Jordan flip-flops, **952**
—— with C. Leondes, DINA, digital analyser for Laplace, Poisson, diffusion and wave equations, **3045**
Ruch, E., with R. Muller, e.m. self-oscillations in rectangular cavity with finite wall conductivity, **67**
Rudd, J. B., 'codan' noise eliminator for a.m. receivers, **2132**; reciprocal ladder networks, **2589**
Rudenberg, H. G., with R. C. Hergenrother, direct-reading oscilloscope for 100-kV pulses, **3067**
Rudnick, P., detection of weak signals by correlation methods, **2124**
—— with V. C. Anderson, thermistor-bridge correlator, **3350**
Rueger, L. J., and R. J. Nuckolls, Stark cell for microwave spectroscopy, **1817**
—— and A. E. Wilson, N.B.S. microwave standard-frequency service, **2063**
—— with others, microwave absorption spectrum of ND_3, **2298**
Ruetz, J. A., with others, attenuation of wire helices in dielectric supports, **1523**
Rukop, H., equations for natural frequencies of coupled circuits from quadripole viewpoint, **1276**
Rumer, Yu. B., theory of conductivity of metals in magnetic field, **378**
Runge, W. T., distortion in anode-modulated transmitters, **262**
Runnecht, G., with G. Heiland, logarithmic-scale valve galvanometer, **3363**
Russell, D. W., and C. H. Weaver, synthesis of servomechanism by root locations, **(A)2150**
Russell, P. E., and H. A. Peterson, harmonic power generation with non-linear reactor, **2455**
Rust, H. H., and E. Hallitis, ultrasonic-wave generators using dumb-bell type magnetostrictive oscillators, **1556**
—— with others, variation of partial processes in magnetostriction, **139**
Rust, W. M., Jr, field test of split-channel 50-Mc/s systems, **3709**
Ruselli, G., aerials of modern high-power television stations, **682**
Ruth, R. P., with others, determination of velocity of light by band-spectrum method, **987**
Rutishauser, H., automatic programme planning for computers, **147**
Ryan, W. E., with R. C. Ellenwood, u.h.f. matching termination, **1073**
Ryazonova, T. P., with V. I. Kalinin, theory of multisegment magnetron, **3458**
Ryder, E. J., mobility of holes and electrons in high electric fields, **3326**
Ryder, J. D., and M. S. McVay, thermocouple a.f. wattmeter, **2394**
Ryle, M., and J. A. Ratcliffe, radio astronomy, **92**
—— with P. A. G. Scheuer, radio investigation of H II regions, **3278**
Rytov, S. M., electron deflection by charged filament, **1299**
—— with M. A. Leontovich, differential law of electrical fluctuations and influence of skin effect, **2951**
Ryvkin, S. M., choice between 'barrier layer' and 'concentration' theories of photoconductivity, **3605**
—— and L. N. Malakhov, effect of oxygen on PbS photoresistors, **3040**

S

van Sabben, D., solar-flare effects and magnetic storms, **3276**; relation between radio-propagation disturbance, geomagnetic activity, and solar noise, **3283**
Saby, J. S., fused-impurity Ge *p-n-p*-junction transistor, **877**
—— and W. C. Dunlap, Jr, impurity diffusion and space-charge layers in fused-impurity semiconductors, **3020**
Sacasa, R. Gea. See Gea Sacasa, R.
Sacco, L., graphs for u.s.w. propagation, **2118**
Sacerdote, G. G., with M. Ferrero, measurement of acoustic impedance, **2545**
Sack, R. A., and J. J. O'Dwyer, frequency dependence of dielectric properties of dipolar substances, **1647**
Sackmann, L. A., representation of experimental results by equations, **370**, **371**
Sagajllo, W., problems in a.f. spectrum analysis, **(D)776**
Saha, A. K., with S. S. Baral, observations at Calcutta of pulses transmitted from Delhi, **2116**
de Saint-André, R., applications of Type-ECH42 triode-hexode, **590**
Sakata, T., conductivity and thermo e.m.f. of Cs_3Sb photocathodes, **3002**
Saker, E. W., temperature variation of rectification characteristics at Se contacts, **1389**
Sakiotis, N. G., and H. N. Chait, ferrites at microwave λ, **931**
—— with others, reduction of loss in ferrite gyrators, **1610**
Sakurai, T., theory of convex-waveguide lens, **3204**
Salam, S. A., with R. Mansfield, electrical properties of molybdenite, **2708**
Salisbury, W. W., with C. H. Papas, magneto-hydrodynamic waves in conducting liquids, **1661**
Salmon, D. P., with W. Bacon, *RC* circuits with voltage gain, **683**
Salomonovich, A. E., automodulation in ferroresonant circuits, **1270**
Salort, P., with P. Chavance, thick obstacles in waveguides, **3190**
Salpeter, J. L., developments in sintered magnetic materials, **3384**
Saltzer, C., second fundamental theorem of networks, **2585**
Salz, N. P., with others, Ge diode as video detector, **2475**
Salzer, J. M., characteristics of digital- and analogue-computer units, **2363**
—— with W. K. Linvill, analysis of control systems involving digital computers, **3075**
Samoilovich, A. G., and V. A. Yakovlev, additional resistance of ferromagnetic metals, **1402**
Sampson, H. O., television lighting technique, **865**
Sánchez Cordovés, J., illumination in television studios, **1164**; television amplifiers, **3744**
Sander, K. F., and J. G. Yates, accurate mapping of e.s. fields in electrolyte tank, **2739**
Sands, E. A., properties of magnetic materials under current-pulse conditions, **128**; analysis of magnetic-shift digit-storage operation, **3352**
Sann, K., with H. Awender, activity measurement for quartz crystals in parallel-resonance circuits, **1273**
van Santen, J. H., with Y. Haven, pre-exponential factors in formulae for ionic conductivity in solids, **3578**
—— with G. H. Jonker, ferromagnetic compounds of Co with perovskite structure, **2701**
Saporte, R., with C. Fert, electron microscopy by reflection, **1457**
Saraga, W., graphical methods for analysis and design, **(D)349**; filters with minimum number of inductors or capacitors, **2595**
—— D. T. Hadley and F. Moss, aerial-radiation-pattern analogue computer, **3198**
Sarazin, A., standing-wave linear accelerator for 1·2-MeV electrons, **3078**
Sarginson, K., with D. K. C. MacDonald, galvanomagnetic effects in conductors, **1974**
Sarser, D., and M. C. Sprinkle, 'Maestro' a.f. power amplifier, **978**
Sarzhevski, P. E., variation of conductivity of quartz, **1378**
Sasaki, T., with others, dielectric constant of Rochelle salt at 3 kMc/s, **2729**
Sato, R., with others, *h't* ionosphere measurements at Wakkanai, Japan, during eclipse of 9th May 1948, **2859**
Saunders, E. A., and G. R. Cooper, meter for coupling coefficient of i.f. transformers, **3658**
Savant, C. J., with others, linear-to-logarithmic voltage converter, **3042**
Savant, C. J., Jr, design curves for notch networks, **2255**
Savornin, F., with J. Savornin, thermoelectric power of *p*-type Si, **82**, **2335**
Savornin, J., and F. Savornin, thermoelectric power of *p*-type Si, **82**, **2335**
Saw, P. D., design of large-screen receiver, **2811**
Sawyer, B., with G. L. Pearson, Si *p-n*-junction diodes, **905**
Saxton, J. A., v.h.f. long-distance propagation in relation to television in United Kingdom, **1110**; Scientific Instrument Manufacturers' Association exhibition, London, 1952, **1547**
—— with J. A. Lane, dielectric dispersion in electrolytes at u.h.f., **698**
Scanlon, W. W., with others, capacitance effects in thin conductive films, **2882**
Scarfe, E. C. R., continuous measurement of cable diameter, **791**
Schachenmeier, R., and F. Weller, refractive index of dipolar gas mixtures at dm λ, **1642**
Schaetti, N., and W. Baumgartner, dark current of electron-multiplier photocells, **1518**, **2492**
—— with W. Baumgartner, infrared-sensitive electron-multiplier photocell, **1520**
—— with E. Keonjian, experimental investigation of transistor noise, **887**; noise in transistor amplifiers, **1288**, **2279**
Scharf, A., with C. D. Miller, isotransport camera for 100 000 frames/sec, **2058**
Scharowsky, E., properties of ZnO single crystals with excess Zn, **3628**
v. Schau, H., with E. A. Pavel, tests on star-quad broadcast-programme cable without loading coils, **1578**
Schelisch, E. F., laboratory power meter, **786**
Schelkunoff, S. A., Advanced Antenna Theory, **(B)940**
—— and H. T. Friis, Antennas, Theory and Practice, **(B)637**
Schenk, J., with others, temperature distribution at end of hot wire, **283**
Scherrer, P., with others, anisotropy of dielectric constant of ice, **2027**
Scheuble, W., sorption properties of thin Ni films, **3271**
Scheuch, D. R., with O. Whitby, output analysis and alignment techniques for phase-rotation s.s.b. transmitters, **2481**
Scheuer, P. A. G., and M. Ryle, radio investigation of H II regions, **3278**
Schiesser, H., and O. Schmidbauer, standardization of magnetic-recording technique, **22**
Schiffman, T., with H. Ekstein, response of linear network to frequency-sweep input, **664**
Schilling, H., with H. Muser, thermoelectric measurements on Cu_2O, **3613**
Schimpf, L. G., with others, junction-transistor tetrode for h.f., **677**, **1184**
Schiske, P., e.s. single lens permitting rigorous calculation, **2095**
Schlaak, N. F., s.s.b. system for overseas telephony, **541**
Schlesinger, K., transfer characteristics and mu factor of picture tubes, **2171**
Schlicke, H. M., quasi-degenerate modes in high-permittivity-dielectric resonators, **1942**
Schliebs, G., basic features of programme for chess-playing computer, **3046**
Schlüter, A., plasma, dynamics of, **1309**, in magnetic field, **1964**, relation between various types of oscillation in, **1965**
Schmid, A. E., 60 c/s magnetic amplifier in position-indicating servomechanism, **335**
—— with others, improved magnetic servo amplifier, **(A)3724**
Schmidbauer, O., field of magnetic recording tape with ideal and with wide-gap pickup head, **1575**
—— with H. Schiesser, standardization of magnetic-recording technique, **22**
Schmidt, E., commercial experiences with 'magna stripe', **2205**; new magnetic-recording tape, **2553**
—— and E. W. Franck, manufacture of magnetic-recording materials, **2204**

Schmidt, H., measurements on BaTiO$_3$, 1694
Schmidt, H. M., measurement of frequency of f.m. transmitter, 3660
Schmidt, K. O., directional-radio equipment and planning of directional links in Western Germany, 2140
Schmidt, P. S., developments in fixed capacitors, 953
Schmidt, W., dynamic characteristics of magnetic amplifiers, 2579
Schneider, F., low running potential of h.f. discharge between plane plates, 703
Schneider, H., investigation of fine structure of valve characteristics, 3143
Schneider, O., statistical treatment of geomagnetic micropulsations, 2643
Schnell, L., measurement of dielectric loss angle, 781
Schnitger, H., and D. Weber, travelling-wave valve, experimental verification of theory of, 280, for 15-cm λ, measurements on, 2499, reduction of noise factor in, 3754
Schoch, A., concept of acoustic energy, 2860; momentum of sound wave, 3165
—— and K. Fehér, investigation of sound transmission through partitions, using models, 609
Schodder, G. R., F. K. Schröder and R. Thiele, improvement of audibility in a theatre, 1572
Scholes, D. H. C., radio in navigation and operation of civil aircraft, 1024
Scholes, W. E., with others, acoustics of Royal Festival Hall, 2198
Scholte, J. W. A., and W. C. van Geel, impedances of electrolytic rectifier, 2801
Scholz, A., and G. Stuwe, frequency markers and scales for visible-indication instruments, 1077
Scholz, W., u.s.w. links for television programme exchange with Berlin, 1810
Schooley, A. H., simple computer automatically plots correlation functions, 3047
—— and S. F. George, signal/noise characteristics of detectors, 529
Schouten, G. H., a.g.c. by means of NTC resistors with heating element, 1953
Schouten, J. F., F. de Jager and J. A. Greefkes, delta modulation, 543
Schrag, R. L., with J. J. Gibbons, solving wave equation for region of rapidly varying refractive index, 803
—— with others, long-delay ionospheric echoes at 150 kc/s, 1992
Schröder, F. K., sound absorption as function of angle of incidence, 2548
—— with others, improvement of audibility in a theatre, 1572
Schroeder, A. C., with R. D. Kell, optimum utilization of r.f. channel for colour television, 3431
Schröter, F., storage and picture-difference methods in television reception, 2163
Schubart, G., with others, dependence of low-temperature conductivity of Cu$_2$O on oxygen pressure, 1385
Schubert, J., with others, measurement of flicker-effect constants, 2725
Schuder, J. C., with J. M. Cage, gas-tube inverter for low direct voltages, 2456
Schultz, G. F., Russian *C*- and *R*-value notations, 2927
Schulz, E., G. Piefke and E. Seibt, h.f. equipment for 24-channel p.p.m. beam R/T system, 822
Schulz, G., with P. Kunze, l.v. counter tubes, 3085
Schulze, A., and H. Eicke, Au-Cr standard resistors, 772
Schumann, W. O., propagation of waves in inhomogeneous plasmas, 712; propagation of very long e.m. waves, and wave spectrum of lightning, 802, 1772; natural oscillations of conducting sphere surrounded by air and ionosphere layers, 3596, 3597
Schunemann, C. F., with J. R. Martin, measurement of λ in mm, 2384
Schurr, K., stabilization of variable-carrier-frequency servomechanisms, 551
Schuster, K., with R. Meier, sound-wave propagation in piezoelectric crystals, 3014
Schwabe, E., effect of small ellipsoidal inclosures on ferromagnetic coercive force, 3028
Schwan, H. P., and K. Sittel, Wheatstone bridge for admittance determinations, (A)3367
Schwantes, R. C., with others, aircraft radio interference measurements, 2075
Schwarcz, L., with others, synchrocyclotron for 450-MeV protons, 1764
Schwartz, E., television projection-type receivers, 251; television projection installations, 1168, (C)2170, 2472
—— with W. Nestel, principles for planning of u.s.w. broadcasting systems, 2789
Schwartz, L. S., second-detector signal/noise improvement, 527
Schwarz, H., ionization method for high vacua, 2011, 3320; photosensitivity of self-quenching G-M counters with external cathode, 3068
Schweiger, R. N., d.c. μA integrator, 1745
Schweitzer, H., efficiency of small mains supply units with capacitively terminated rectifiers, 2799
Schwenkhagen, H. F., Laplace transformation, 3041
Schwetzoff, V., development of Cs-AgO photocathode during heat treatment, 3447
Sciama, D. W., with others, electronic band structure of PbS, 2037
Scott, A. H., measurement of multimegohm resistors, 3056
Scott, D. R., and R. F. Hudson, analogue computer for mine-ventilation networks, 3349
Scott, H. H., intermodulation measurements, 2737
Scott, J. C. W., solar effect on E and F_1 layers at high latitudes, 406
Scott, N. R., amplitude stability in oscillating systems, 3242
Scott, R. E., S. Fine and A. Macmullen, nonlinear filtering and wave-shape multiplexing, 670
Scovil, G. W., Hall effect in Ti, 2049
Seaman, M. S., with F. A. Benson, phase-angle measurements with c.r.o., 1739
Seeger, K., electron emission from metals after irradiation, 3266
Seeliger, R., adjustment of spherically corrected electron-optical systems, 2100
Seemann, E., assessment of transient distortion of loudspeakers, 17
Segrave, P. A., with others, design of superheterodyne receiver for television, 1504
Segrott, W. H., design for communications receiver, 3697
Seguin, P., with others, preparation and properties of arsenide semiconductors, 3325
Seibt, E., with others, h.f. equipment for 24-channel p.p.m. beam R/T system, 822
Seiden, J., cosmotron, elimination of effects of faulty alignment in, 2405, effect of magnetic defects in, 2753
Seiffert, K. W., oscillograph representation of degree of distortion in teleprinter signals, 3408
Seiler, K., and others, thermally produced lattice defects in Ge, 1697
—— with D. Geist, temperature dependence of backward current in Ge p-n junctions, 428
—— with others, plastic deformability of Ge, 2033
Seitz, F., plasticity of Si and Ge, 1404
Selis, O. J., radio navigation and air traffic safety measures, 2010
Semmelink, A., e.m. testing of winding ropes, 3378
—— with J. P. A. Lochner, electroacoustics laboratory at School for the Deaf, Worcester, C.P., 8
Sempers, C. A., with G. W. Bruger, compact radar test unit, 1445
Sen, H. K., solar 'enhanced radiation' and plasma oscillations, 1322; estimate of density and velocity of solar material from data on r.f. outbursts, 1982
Sen, S. K., and B. M. Bhattacharyya, triggering of plate-coupled multivibrator by negative pulses, 3557
Senett, W. P., and R. W. Pierce, stabilized power supply for electrometer valves, 1133
Senior, T. B. A., diffraction of dipole field by half-plane, 2296
Septier, A., e.s. immersion objective, new type of, 186, resolving power of, 187, with thick electrodes, potential distribution on axis of, 1102, with plane electrodes, 1458, 1770; obtaining electron images of surfaces bombarded by ions, 3388
Seraphin, B., with J. Fassbender, growth and decay of photoconductivity of CdS single crystals, 1688
Serny, J., stabilizer for high direct voltages, 838
Setchfield, J. B., with others, microwave techniques for communication links, 219
Severin, H., Kirchhoff's theory in calculation of cm-wave diffraction effects, 1296
—— and C. Starke, diffraction of sound waves by circular apertures, 1557
Seymour, E. F., with W. S. Carley, high-characteristic-impedance delay lines, 2257
Sharma, J., with H. N. Bose, decay of long-period afterglow of alkali halides after c.r. excitation, 2680
Sharp, C. E., and G. Goubau, u.h.f. surface-wave transmission line, 930
—— with R. E. Lacy, f.m. microwave radio relay equipment, 1127
Sharpe, J., with P. Holton, corona-stabilized h.v. supply for proportional counters, 1803
Shaw, E. A. G., attenuation of higher modes of acoustic waves in rectangular tube, 2537
Shea, R. F., stabilization of transistor operation, 688, (C)3248
Shearman, E. D. R., with C. Clarke, automatic ionospheric-height recorder, 3356
Sheingold, L. S., susceptance of circular obstacle in round waveguide with TE$_{01}$ wave, 2565
—— with others, graphical analysis of two-port waveguide junction, 3191
Shekel, J., matrix representation of transistor circuits, 642; sketch of algebra of switchable networks, 2913; gyrator as 3-terminal element, 3228
Shellard, H. G., with others, humidity of upper troposphere and lower stratosphere over southern England, 1671
Shelton, E. E., and F. Wade, corona discharge tubes for voltage stabilization, 1136, (D)2803
Shen, D. W. C., synthesis of uniform transmission line, 2880
Shephard, N. H., channel-splitting demonstrations in Syracuse, 3707
Shepherd, A. A., poisoning of oxide-cathode emission by oxygen, 1190, 2503
Shestopalov, V. P., waveguide containing spiral, partly filled with dielectric, 2884
Shimizu, T., with others, $h't$ ionosphere measurements at Wakkanai, Japan, during eclipse of 9th May 1948, 2659
Shimoda, K., coherence of microwaves generated by klystron, 2943
Shinn, D. H., with T. C. Cheston, scanning aberrations of radar lenses, 731
Shipley, D. W., spherical aberration of e.s. electron lens, calculation of, 1100, measurement of, 1459
Shipley, F. M., with V. A. Johnson, adiabatic Hall effect in semiconductors, 3018
—— with others, low-temperature Hall curve for n-type Ge, 426
Shirane, G., and A. Takeda, transition energy and volume change in BaTiO$_3$, 2053
Shive, J. N., properties of Type M-1740 p-n-junction photocell, 889; properties of Ge phototransistors, 2825
—— with others, optical encoder and digit register using transistors, 766, 2373
Shockley, W., transistor physics and analogue transistors, 746; unipolar field-effect transistor, 879; interpretation of e/m values for crystals, 1301; cyclotron resonances, magnetoresistance and Brillouin zones in semiconductors, 3017
—— and R. C. Prim, space-charge-limited emission in semiconductors, 3324
—— and W. T. Read, Jr, statistics of recombination of holes and electrons, 420
—— with T. S. Benedict, microwave determination of collision frequency of electrons in Ge, 2330
Shortley, G., Tchebycheff-polynomial operators in numerical solution of boundary-value problems, 2713
Shul'man, A. R., and V. L. Makedonski, secondary emission from dielectrics under single-pulse conditions, 3008
Shul'man, M. S., with others, composition and properties of BaTiO$_3$ ceramics in strong fields, 3010
Shulman, R. G., and D. M. Van Winkle, pressure-welded Ge p-n junctions, 2034
Sichak, W., with others, high-gain loop aerial for television broadcasting, 1236
Siebertz, K., new-type discharges in magnetic fields, 1652
Siedentopf, H., and A. Behr, ionosphere disturbance of 23rd-28th Feb. 1952, 101
Siegman, A. E., with D. A. Watkins, helix impedance measurements using electron beam, 3753
Sieminski, E., field plotting in deflection-yoke design, 256
Sigeharu Yamada. See Yamada, Sigeharu.
Silberg, P. A., with others, positive and negative ions in c.r. tubes, 2846
Silberstein, J. M., test-pattern generator for production testing of television receivers, 2746
Silberstein, R., with W. L. Hartsfield, comparison of c.w. field intensity and back-scatter delay, 808
Silleni, S., intelligibility recorder for radiotelegraphy signals, 3696
Sim, A. C., calculation of energy flow by means of Laplace transform, 955; design of series peaking transformers, 1598; h.f. proximity-effect formula, 2918
Simmons, A. J., compact wide-band microwave $\lambda/4$ plate, (C)2215
Simmons, E. L., with B. V. Rollin, infrared photoconductivity of Si at low temperatures, 2014
Simms, A. G., frequency spectrum of locked oscillator, 2605
Simon, H., acoustic problems at Waldbuhne open-air theatre, Berlin, 1573
—— with others, aerial systems for 24-channel p.p.m. beam R/T system, 822
Simon, J. C., and G. Broussaud, u.h.f. band-pass filters, 1933
—— and G. Weill, longitudinal radiation of dielectric aerials, 1244
Simon, R. F., with others, instrumentation for geophysical exploration, 2749
Simon, S., cold-cathode tubes in switching systems, 538
Simpkin, K. H., a.c. and d.c. as signal source in analogue computers, 2717
Simpson, J. A., with others, electron-beam interferometer, 3074
Simpson, J. H., and H. L. Armstrong, reverse characteristics of Ge rectifiers, 1715
Simpson, L. C., Israel intercity R/T systems, 2442
Simpson, P. A., with L. T. Sogn, loading of quartz oscillator plates, 966
Sims, G. D., with P. A. Lindsay, application of thermodynamics of irreversible processes to magnetron theory, 2847
Sinclair, D. B., with A. Peterson, single-ended push-pull a.f. amplifier, 3250
Sinegubova, L. S., with others, effect of polarizing field on dielectric properties of BaTiO$_3$, 112
Singakov, E. V., and B. K. Chernyi, potential distribution in titanate ceramic dielectrics, 439
Singer, E., with others, rotating-screen colour-television tube, 3740
Singer, S. F., E. Maple and W. A. Bowen, Jr, 'dynamo' currents and conductivities in ionosphere, 1353
Sinno, K., F_2-layer variations accompanying geomagnetic storms, 3303
Sinyakov, E. V., E. A. Stafiychuk and L. S. Sinegubova, effect of polarizing field on dielectric properties of BaTiO$_3$, 112
Sisson, E. D., *RC* networks in amplifier design, 2593
Sittel, K., and E. Menzer, improved radiosonde, 497
—— with H. P. Schwan, Wheatstone bridge for admittance determinations, (A)3367
Skalicky, M., maximum power in termination impedors, 1258
Skanavi, G. I., dielectrics, 1372
Skipper, R. E., with others, moisture aging of powder-core toroids, 2355
Skomal, E. N., with C. I. Beard, *RC* commutator for signal/noise improvement, 2784
Skudrzyk, E., with V. Met, small apparatus using BaTiO$_3$ oscillator for ultrasonic testing of materials, 1756
Skwirzynski, J. K., response of vestigial-sideband system to 'sine-squared' step transition, 1066
Slade, B. N., point-contact transistors, 2487, control of frequency characteristics and stability of, 884
—— with G. M. Rose, transistors operate at 300 Mc/s, 585
Slater, J. C., soluble problem in energy bands, 391
Slattery, T. G., detection of sine wave in noise by means of nonlinear filter, 206
Slavin, W., with others, portable 250-kV accelerators, 3679
Slichter, W. P., and E. D. Kolb, impurity effects in thermal conversion of Ge, 116; solute distribution in Ge crystals, 3343
Slonczewski, T., servo system for heterodyne oscillators, 2378
van Slooten, J., mechanism of synchronization of *LC* oscillators, 2960
Smale, J. A., with A. W. Cole, picture transmission by radio, 558
Small, G. F., u.h.f. filters and switches for London-Birmingham television relay link, 951
Smart, J. S., with L. N. Howard, specific heat discontinuity in antiferromagnets and ferrites, 3623
Smelt, J. A. M., with others, steel c.r. tube for television receivers, 3132
Smit, J., with others, ferromagnetic properties of ferroxdure materials, 751
Smith, B. D., coding by feedback methods, 3414
Smith, E. K., Jr, and S. Weintraub, constants in formula for atmospheric refractive index at r.f., 2996, 3287
Smith, F. G., radio stars, ionospheric refraction of 81.5 Mc/s waves from, 407, determination of position of, 1329, measurement of diameter of, 1330
—— with K. E. Machin, occultation of radio star by solar corona, 98
Smith, H. M., estimation of absolute frequency in 1950-1951, (A)253, 1058; quartz clocks of Greenwich time service, 3354
Smith, J. J., vector potential derivation from scalar potentials, (A)2285, 3574; tables of Green's functions, Fourier series and impulse functions, [illegible]
Smith, J. P., with F. A. Benson, characteristics of corona stabilizer tubes, 3155
Smith, J. R., with R. Anderson, delayed-trigger oscillograph for television waveforms, 1438
Smith, J. S., bandwidth of multiplex channels, 3103
Smith, K. D., properties of junction transistors, 2490
Smith, P. B., with others, magnetic viscosity under discontinuous and continuous field variations, 123
Smith, P. H., charts for coaxial-line probe measurements, 458
Smith, P. W., Jr, velocity of sound, errors in indirect measurements of, 916, measurement of, 1566
Smith, R. A., equation connected with theory of triode oscillations, 971
Smith, S. T., and H. E. Brown, direct-viewing memory tube, 3760
Smith, V. G., with J. Kates, Scotch-plaid raster for c.r. tube digit storage, [illegible]
—— with A. G. Ratz, gating method for parallel computers, 2374
Smith, W. V., with others, line breadths of microwave spectrum of O$_2$, 91
Smith-Rose, R. L., survey of British research on wave propagation with particular reference to television, 1109; U.R.S.I. meeting in Sydney, 2521
Smith-White, W. B., Poisson-Kelvin hypothesis and theory of dielectrics, 989
Smolenski, G. A., dielectric properties of zirconates, stannates and titanates of bivalent metals, 433
Smyth, M. J., solar corona and geomagnetism, 1326
Smythe, W. R., current distribution in cylinders, 1650
Snel, D. A., magnetic sound-recording equipment, 2551
Snider, R. H., with others, high-speed direct-scanning facsimile system, (A)841, 3730
Snow, H. A., with others, counter-circuit multiplex receiver, 3090
Snow, W. B., a.f. input circuits, 2615
Synder, H. S., with others, strong-focusing synchrotron, 1454, origin of, 3678
Snyder, R. L., Jr, input-output system of EDVAC, 2371
Soanes, S. V., problems in a.f. spectrum analysis, (D)776; response of *RLC* circuits to linear-frequency-sweep voltage, (D)2930
Sobel, A., with H. T. Sterling, constant-current a.f. power amplifier, 1635, 2609
Söding, H., rigorous basis of intermodulation method of nonlinear-distortion measurement, 3059
van Soest, J. L., symposium on noise, historical introduction, 908
Sogn, L. T., and P. A. Simpson, loading of quartz oscillator plates, 966
Sohon, H., wide-band phase-delay circuit, 3192
Sokal, N. O., cathode-follower design charts, 3565
Soldi, M., thermistors in r.f. bridge for low admittances, 1748
Solntsev, G. S., M. Z. Khokhlov and E. A. Rodina, single-electrode discharge at 31·7 Mc/s, 1207
Somayajulu, Y. V., coefficient of recombination in ionosphere, 3653
Somers, E. V., propagation of acoustic waves in liquid-filled cylindrical hole, 2858
Somerville, J. M., sparking potentials in transverse magnetic field, 84
Somerville, T., and C. L. S. Gilford, composite c.r.o. displays of acoustic phenomena, 307
Sommer, J., new commercial barretters, 646
Sommerman, G. M. L., with P. B. Jacob, Jr, dependence of breakdown direct voltage on humidity and time, 2290
Sorger, G., with R. Feldtkeller, magnetic after-effects, 2041
Soria, R. M., C. C. Camillo and J. G. Krisilas, liquid-dielectric r.f. coaxial cables, 3472
Sosin, B. M., combining filter for common-aerial vision and sound transmission, 1162
Sourdillon, M., Boys-camera study of lightning discharges, 1683
Sparks, I. L., and H. R. Philipp, retarding-potential method for measuring conductivity of oxide-coated cathodes, 2835
Sparrow, E. L., with others, synthesis of cascaded 3-terminal *RC* networks, 856
Spaven, W. J., high-*Q* measurement, 464
Spears, R. A., design and applications of quartz-crystal units, 441
Speer, F., with H. Gobrecht, measurement of secondary emission, 3581
Spence, R. D., with E. Hiedemann, coherent theory of relaxation phenomena, 694
Spencer, D. E., with P. Moon, coordinate systems associated with elliptic functions, 3347
Spencer, N. W., with others, dynamic probe measurements in ionosphere, 3291
Spencer, P. L., grid-type magnetron for modulation at u.h.f., 2519
Spencer, R. H., transistor-controlled magnetic amplifier, 3211
Spilsbury, R. S. J., Rugby standard-frequency transmissions, 1782
Spindler, C. W., Jr, all-triode electronic switch, 343
Spindler, W., with E. Zwicker, influence of nonlinear distortion on audibility of frequency vibrato, 2870
Sponable, E. I., eidophor system of theatre television, 2474
Spooner, D. J., problems in design of marine transmitters, 3443
Springer, A. M., apparatus for continuous very-long period recording of sound, 3180
Sprinkle, M. C., with D. Sarser, 'Maestro' a.f. power amplifier, 978
Sproson, W. N., M. Gilbert and W. West, fundamental aspects of colour television, 1814
Sproull, R. L., with E. M. Pell, recording a.c.-Hall-effect apparatus, 1057
Squires, W. K., and R. A. Goundry, constant-input-impedance second detector for television receivers, 254
—— and H. L. Newman, video amplifiers with optimum transient response, 3133
Srinivasan, D., with others, dependence of sonic intensity at source on absorption coefficient in liquids, 2543
Stafiychuk, E. A., with others, effect of polarizing field on dielectric properties of BaTiO$_3$, 112
Stahl, R. J., and G. A. Walters, noise reduction in intercommunication systems, 2787
Stahmann, J. R., with others, aircraft radio-interference measurements, 2075
Staley, R. C., with K. H. Jehn, correlations of 100-Mc/s propagation with meteorological effects, 2772
Standing, K. G., and R. W. Peelle, improvement of resolution of scintillation counters, 2107
Stansel, F. R., transistor amplifier, formulae for, 1601, common collector, at carrier frequencies, 3518
Stanworth, J. E., tellurite glasses, 143
Staras, H., scattering of e.m. energy in randomly inhomogeneous atmosphere, 804
Stark, J., experimental investigations on the nature of light, 1292
Starke, C., with H. Severin, diffraction of sound waves by circular apertures, 1557
Starks-Field, A. B., timebases, reactive, for television receivers, [illegible], negative-feedback, stability in, 2272
Starodubtsev, S. V., with others, action of electron stream on current sensitivity of Se and Ag$_2$S photocells, 3140
Starr, A. T., Radio and Radar Technique, (B)2854
—— and T. H. Walker, design of microwave radio links, 217
Starynkevitch, D., design of ladder filters, 1932
Steele, E. L., current gain in p-n-p junction transistors, 881
Steele, M. C., number theory and magnetic properties of electron gas, [illegible]
van Steenis, O. L., with others, steel c.r. tube for television receivers, 3132
Stegen, R. J., u.h.f. television radiators using slot arrays, 2900
Stemmel, K., solution of 'Rukop problem' for arc and dynatron oscillators, [illegible]
Stein, N., with W. H. Hannahs, printed unit assemblies for television, 352
Stein, S., with others, graphical analysis of two-port waveguide junction, 3191
Steinberg, J. L., radio noise receivers, 3402
—— with others, radio observations of eclipses on 1st Sept. 1951 and 25th Feb. 1952, 94; distribution of radio brightness on solar disk at 9.35 kMc/s, 3272
Steinbuch, K., electronic switching elements in communication engineering, 48; channel separation in p.p.m., 1788
Stenoien, J. O., with others, microwave measurements on metal powders suspended in wax, 2326
Stenzel, H., sound field of rectangular piston membrane, 1877
Stephens, G. L., Radio Interference Suppression, (B)818
Stephenson, I. M., with A. L. Cullen, torque-type wattmeter for 3-cm [illegible] waves, 1082
Stephenson, J. D., with others, c.r. tubes and valves for television receivers, 1521
Sterling, H. T., and A. Sobel, constant-current a.f. power amplifier, 1635, 2609
Sternberg, R. L., and H. Kaufman, theory of multiplex [illegible] trans-

mission lines, 1581
Sterner, J. F., wide-range frequency calibrator, 1751
—— with J. A. Cornell, frequency-sweep oscillator for u.h.f. television band, 487
Sternheimer, R. M., double focusing of charged particles with wedge-shaped magnetic field, 1456
Stevels, J. M., power factor of glasses as function of composition, 443
Stewart, R. M., Jr, and A. R. Kassander, Jr, electronic statistical tabulator, 2369
Stibbé, H., microphony in superheterodyne oscillators, 814
Stiber, S., ferrite cores in electronic tuning of r.f. circuits, 3569
Stieltjes, F. H., with A. J. W. M. van Overbeek, bandwidth limit of junction transistors, 3747
Stigmark, L., determination of charge on electron from shot-noise measurements, 1959
Stilwell, G. R., with F. W. Reynolds, mean free paths of electrons in evaporated Cu and Ag films, 714
Stjernberg, B. K. E., with others, microwave propagation in optical range, 3097
Stockinger, F., motions of particles in field of electromagnet, 1663
Stockman, H., inherent feedback in triodes, 1865; degenerative pentode equivalent circuit, 2611
Stöhr, H. J., Wien bridge as frequency-determining element in selective amplifiers, 1951
Stone, H. A., Jr, ferrite-core inductors, 1923
Stone, W. M., statistical theory of detection of randomly modulated carrier, 3602
Storch, L., note on network theorem, 1607; design of Π-network aerial couplers, (D)2588; response characteristics, (D)3222; theorem on impedance-transforming properties of reactive networks, 3541
Storer, J. E., L. S. Sheingold and S. Stein, graphical analysis of two-port waveguide junction, 3191
Storey, L. R. O., ultrasonic absorption in mixtures of ethyl alcohol and water, 1222
Storm, H. F., steady-state operation of saturable reactors with inductive d.c. load, 3527
Stout, V. L., luminescence and thermionic emission of BaO, 1712
Stover, J. S., operational experience with split-channel 50-Mc/s system, 3710
Strafford, F. R. W., receiving aerials for British television, 1237
Straiton, A. W., reflection of microwaves from ground and water surfaces, 1787
—— with others, dielectric constant measurements at λ 8·6 mm, 3655
Stram, O., with H. Epstein, magnetostrictive ultrasonic delay line, 2057
Strandberg, M. W. P., with J. R. Eshbach, Zeeman-effect measurements on microwave spectra, 1318
Strasberg, M., effects of terminations on insertion loss of ladder filters, 2596
Strässer, C., with L. 't Hart, modern transmitting equipment for merchant ships, 2818
Strauss, H. E., channel spacings at 152 to 174 Mc/s, 3102, 3706
Strazza, L. E., v.h.f. multiplex radio system in Nyasaland, 1485
Street, R., J. C. Woolley, and P. B. Smith, magnetic viscosity under discontinuous and continuous field variations, 123
—— with others, antiferromagnetic properties of CoO-MnO mixtures, 2343
Stride, P. L., search radar for civil aircraft, 109
Stringer, J. B., with M. V. Wilkes, micro-programming in digital computer, 2716
Strohfeldt, M., R. W. E. McNicol and G. de V. Gipps, ionosphere measurements at oblique incidence over eastern Australia, 807
Ströle, D., design of control systems, 1760
Stroobants, P., optimum number of lines for television system as dependent on size of receiving screen, 844
Strull, G., CdS as crystal rectifier, 3136
Strum, P. D., crystal mixer performance, 2941
Struthers, J. D., with C. S. Fuller, Cu as acceptor element in Ge, 119
Strutt, M. J. O., methods of reducing noise/signal ratio at output terminals of amplifiers, 976
Stuetzer, O. M., transistors in aircraft equipment, 672; junction fieldistors, 880
Stuhlmann, W., equipment for inductive heating shown at 1952 Technical Fair, Hanover, 178
Stuke, J., absorption and reflection of amorphous and hexagonal Se, 2019
Stumpers, F. L., signal/noise ratio for various modulation systems, 828
Sturley, K. R., electronic switch, 654
Sturrock, P. A., imaging properties of electron beams in static e.m. fields, 1657
Stuwe, G., with A. Scholz, frequency markers and scales for visible-indication instruments, 1077
Stuyts, A. L., G. W. Rathenau and E. W. Gorter, preferred crystal orientation in ferromagnetic ceramics, 1036
—— with others, ferromagnetic properties of ferroxdure materials, 751
Styles, R. S., and F. W. Campbell, radar observations of rain from nonfreezing clouds, 2004
Suchet, J., with N'Guyen Thien-Chi, voltage regulators using nonlinear elements, 230
van Suchtelen, H., ferroxcube aerial rods, 939; losses in ferroxcube rods and tubes, 3636
—— with others, effects due to curvature of valve characteristics, 1854
Suchy, K., wave optics and ray optics in inhomogeneous anisotropic absorbing media, 2954; effect of geomagnetic field on ionospheric absorption of short waves, 1678
Sucksmith, W., magnetic properties of stainless steel wire, 1708
Suddeth, J. A., with others, electron-beam interferometer, 3074
Sueur, F., 16th plenary assembly of C.C.I.F., Oct. 1951, Florence, 1120
Sugita, T., with E. Yamaka, energy-band structure in Si crystal, 3327
Sugiura, M., e.m. shielding effect of ionosphere, 2667
—— M. Tazima and T. Nagata, anomalous ionization over auroral zone during magnetic storms, 2991
Suhl, H., magnetic effects on noise in Ge filament, 2695
—— and L. R. Walker, Faraday rotation of guided waves, (C)1232
Suhrmann, R., and C. Kangro, semiconductor properties of systems K-Sb, Cs-Sb, K-In, Cs-In, 2030
Sullivan, A. W., 'ogiver' radio-noise meter, 1443
—— and J. M. Barney, nonlinear statistical filter, 667
Sulzer, P. G., reliable locked-oscillator pulse timer, 2945; precision transistor oscillator, 3051; junction-transistor circuit applications, 3244; low-distortion audio oscillator, 3517
Suran, J. J., with W. F. Chow, transient analysis of junction-transistor amplifiers, 3513
Surdutz, A., Faraday effect in conductors and semiconductors, 2299; u.h.f. measurement of dielectric constant and complex permeability, 2331
Susskind, C., isotropic artificial dielectric, (D)113
Sutcliffe, H., transmission-line impedance measurements, 2733
Suzuki, H., with others, temperature dependence of zero-bias resistance of Cu_2O rectifiers, 3345
Suzuki, T., with T. Nagata, solar-flare type of variation of geomagnetic field and integrated conductivity of ionosphere, 2664
Swann, W. F. G., fundamental theory of electrets, 3257
Swerling, P., with E. Reich, detection of sine wave in Gaussian noise, 2429
Swift, W. B., and T. J. Higgins, e.m. propagation in waveguides of rhombic cross-section, 2883
Swihart, J., and E. Akeley, axial motion of electrons in linear accelerator, 3077
Swingle, D. M., tables for tropospheric refractive index, 1670
Syeles, A. M., with others, permanent magnet from powdered MnBi, 1035
Symon, E., with others, electronic tachometer, 2747
Szegho, C. S., with others, rotating-screen colour-television tube, 3740
Sziklai, G. C., symmetrical properties of transistors, 2583, 3213
—— R. D. Lohman and G. B. Herzog, transistor circuits for television, 2812

T

Ta-You Wu. See Wu, Ta-You.
Taeger, W., analysis of three types of valve amplifier circuit, 1632; i.f. amplifiers with bifilar coils, 3735
Tafel, H. J., print-through effect in magnetic tape, 1901
Taft, E. A., and L. Apker, photoemission from Cs_2Te and Rb_2Te, 1689
—— with L. Apker, field emission from photoconductors, 1391; photoconduction in anodic Ta_2O_5, 733
—— with others, electron scattering and photoemission from Cs_3Sb, 1690
Tagholm, L. F., and G. I. Ross, selection and testing of sites for television transmitters in United Kingdom, 1172
Taglang, P., with A. J. P. Meyer, influence of magnetic field on polymorphic transformation in a ferromagnetic material, 2339
Tai, C. T., e.m. back-scattering from cylindrical wires, 36
Takahasi, H., with others, hysteresis loops of $BaTiO_3$ ceramic at h.f., 3012
Takakura, T., directivity of radio emission from sunspots, 1981
—— with others, dielectric constant of Rochelle salt at 3 kMc/s, 2729
Takeda, A., with G. Shirane, transition energy and volume change in $BaTiO_3$, 2053
Takeda, I., with S. Yoshida, secondary emission from oxide cathodes, 2836
—— with others, dissociation of oxide-coated cathode, 2834
Tamm, K., and I. Pritsching, frequency analyser with mechanical filter, 1227
—— with G. Kurtze, measurements of sound absorption in water and aqueous solutions of electrolytes, 2196
—— with E. Meyer, wide-band absorbers for liquid-borne sound, 1569
Tanenbaum, M., with G. L. Pearson, magnetoresistance effect in InSb, 2696
Tanner, W. E., miniaturization of airborne filter chokes, 1924
Taplin, J. F., with W. R. Ahrendt, Automatic Feedback Control, (B)840
Tartakovski, B. D., and M. M. Efrussi, testing sound-absorbing materials, 3466
Tasny-Tschiassny, L., initial conditions in transient analysis, 1247
Tavernier, P., and P. Prache, effect of pressures on resistance of thermistor, 342
Taylor, C., with others, synchronization of pulsed high-energy ion beams, 1448
Taylor, D., industrial applications of nucleonics, 495
Taylor, H. O., tube method of measuring sound absorption, 925
Taylor, J. C. E., with W. B. W. Alison, direct-reading thermistor bridge, (D)2740
Taylor, N. W., relativistic e.m. equations, 707, 1956
Taylor, R. C., and C. U. Watts, filter characteristics by direct method, (A)961, 3544
Taylor, W. E., N. H. Odell and H. Y. Fan, grain-boundary barriers in Ge, 1406
—— with L. Roth, preparation of Ge single crystals, 744, (C)1408
Tazima, M., with T. Nagata, solar-flare type of variation of geomagnetic field and integrated conductivity of ionosphere, 2665
—— with others, anomalous ionization over auroral zone during magnetic storms, 2991
Tchernicheff, A., rounding of signals by filter in radiotelegraphy transmitter, 1847
Teasdale, R. D., and G. N. Crawford, cut-off frequency for cylindrical waveguide with coaxial dielectric rod, 2886
—— with W. A. Edson, susceptance slope and selectivity in oscillator design, 2928
Tebble, R. S., J. E. Wood and J. J. Florentin, temperature variation of magnetization of Ni, 1033
Teichmann, T., and E. P. Wigner, e.m. field expansions in loss-free cavities, 2268
Teissié-Solier, M., and J. Lagasse, generators of repeated surge waves, 1088
Tellegen, B. D. H., network theorem, with applications, 62; synthesis of 2*n*-poles by networks with minimum number of elements, 3238
Telfer, J. E., television applications in industry, scientific research, and education, 1512, 2815
Tellier, J. C., with G. W. Preston, lock-in performance of a.f.c. circuit, 1280
Templeton, I. M., with B. V. Rollin, noise in semiconductors at v.l.f., 2039
Tenger, P., equivalent *Q* of *RC* networks, (D)3221
Tennes, C. J. with E. L. Kent, electronic musical instrument, 317
Tenzer, R., null method for measurement of magnetic induction, 1744
Terlecki, R., B.T.R. frequency-shift c.r. monitor, 1436
Terletski, Ya. P., with A. A. Korchak, e.m. radiation from cosmic protons and r.f. radiation from galaxy, 1831
Terris, A., with others, properties of ferrites at v.h.f., 1312
von Tersch, L. W., and R. L. Doty, automatic ejection from betatrons and synchrotrons, 3677
Tetzner, K., transmitter and studio for private u.s.w. stations, 2178
Teves, M. C. and T. Tol, electronic intensification of fluoroscopic images, 1098
Teviotdale, A., Zener's theory of ferromagnetism, 1002
Tharp, N. B., multiplex microwave system, 3107
Thaxton, H. M., with others, autocorrelation function from ergodic hypothesis, 535, for teleprinter signals, 537
Thayer, R. E., auroral effects on television, 1173
Thayer, W., Jr, with J. S. Brown, high-*Q* a.f. resonant filters, 351
Thedieck, R., forming of Ge surfaces, 3330; mechanism of point-contact transistor, 3331
Theile, R., signal generation in television camera tubes, 1828, 1829; 3433
—— and H. McGhee, secondary-electron multipliers in image iconoscopes, 855
Theunissen, F. A. P. M., noise of metal contacts, 3498
Thiele, R., with others, improvement of audibility in a theatre, 1572
Thien-Chi N Guyen. See N'Guyen, Thien-Chi.
Thiessen, G., magnetic field strength in sunspots, 2303
Thinius, E., equalizing action of bridged-T networks, 2254
Thirup, G., measuring complex voltage ratios in range 1–100 Mc/s, 1735
—— and F. A. Vitha, measuring complex voltage ratios at 1–100 Mc/s, 2731
Thomas, A. B., design of peaking transformer, 2233; principles and operation of gas-filled counter tubes, 3763
Thomas, D. E., transistor amplifier cut-off frequency, 689; low-drain transistor a.f. oscillator, 679
Thomas, E. E., with others, observations of dislocations in Ge boundaries, 2693
Thomas, L. A., modern trends in communication material, 3635
Thomas, P. A. V., synchronizing circuit for variable input voltages, 339; analogue reciprocal-function unit for pulse signals, 2946
Thompson, A. P., and J. R. Musgrave, production, properties and applications of Ge, 1405
Thompson, G. T., with J. E. Houldin, h.f. bridge with variable ratio arms, 1433
Thomson, A. G., properties and applications of PVC, 1720
Thomson, W. E., networks, with maximally flat delay, (C)54, with sine-squared impulse response, synthesis of, 348, (D)1609; theory of time series for waveform-transmission systems, 959
Thon, W., with others, radiation by fast electron beams, 3582
Thrower, C. V., with H. H. Woodson, compensation of magnetic-amplifier servo system, 3114
Thurston, E. G., sensitivity of circular bimorph transducer, 926
Thurston, G. B., absolute measurement of impedance of acoustic elements, 917
Tierney, W. L., radio relay stations of the TD-2 system, 216
van Tilburg, P., and J. A. Verhoef, ferroxdure focusing unit for television picture tubes, 862
Tillman, J. R., J. Butterworth and R. E. Warren, frequency dependence of mutual conductance of aged oxide-cathode valves, (A)2838
—— with H. G. Bassett, transient effects in point-contact transistors, 2491
Tipple, P. M., with others, contact properties of *p*-type Ge, 117
Tischer, F. J., video amplifiers, amplification and bandwidth of, 69, relations between amplitude and phase distortions in, 980, effective bandwidth of, 1947, with extreme bandwidth, 2275; helical measurement line for microwaves, 779
Tod, D. S., with F. Hollinghurst, specification and testing of television wire-broadcasting systems, 1755
Toitot, M., and A. Boulloud, discharge between positive point and plane in compressed air, 3265
Tol, T., with M. C. Teves, electronic intensification of fluoroscopic images, 1098
Tolbert, C. W., with others, dielectric-constant measurements at λ 8·6 mm, 3655
Tolpygo, K. B., determination of mass of current carriers in semiconductors, 1381
—— and I. M. Tsidil'kovski, thermal rectification effect, 3015
Toman, K., W. G. Albright and E. C. Jordan, meteorological effects on v.h.f. propagation, 1784
Tombs, D. M., 3-dimensional locus curves for oscillatory circuits, 2266
Tomiyasu, K., and S. B. Cohn, Transvar directional coupler, 2931
Tomlinson, T. B., space-charge reduction of l.f. fluctuations, 281; temperature dependence of flicker effect, 3150
Tomovich, R., universal unit for differential analyser, 146
Tomura, M., and Y. Abiko, electron multiplication in hard flows of Se rectifiers, 2350
Tonnesen, T. B., transistor properties of semiconductors, 121
Toombs, R., with others, B.B.C. monitoring technique for unattended transmitters, 348
Toraldo di Francia, G., with L. Ronchi, determination of reflection coefficient of stratified medium by calculus of variations, 1314
Torcheux, E., with É. Honoré, Rana radio-navigation system, 3314
Torikai, Y., transmission of ultrasonic waves through plane absorptive plate in liquid, 2869
Torikai, Y., and K. Negishi, phase method of visualizing ultrasonic waves, 2865
Toth, E., application of transistors in superheterodyne receivers, (A)3403
Towers, H. C., radio on Indian railways, 1122
Townsend, G. B., incorrect interlacing in accurately synchronized television receivers, 1498
Townsend, R., serial digit adders for variable radix of notation, 3645
Trad, V., and R. Muniz, theatre projection television equipment, 562
Travers, P., design of conditionally stable feedback systems, 2453
Tredgold, R. H., with others, antiferromagnetic properties of CoO·MnO mixtures, 2343
Treen, K. F., direct-reading thermistor bridge, (D)3366
Tremellen, K. W., with F. A. Kitchen, ionospheric influences in television reception, 1176
—— with others, ionospheric propagation of v.l.f., l.f. and m.f. waves, 1781
Trent, R. L., transistor reversible binary counter, 650, 2243
von Trentini, G., new e.m. lens, 937; parabolic radar aerial with rotating beam, 1245; polystyrene and lucite rod aerials, 3479; grids as circuit elements for e.m. waves in space, 3483
Trickett, E. S., with L. K. Wheeler, measurement of spray particles, 3684
van Trier, A. A. T. M., Faraday rotation of guided waves, 2890
Trigg, R. D., voltage stabilization with series valve control, 2802; simplified treatment of phase-shift networks, 3230
Troitski, V. S., sensitivity of radio thermometers, 2761
Trolan, J. K., with others, field emitter, 3082
Trolese, L. G., J. P. Day and R. U. F. Hopkins, propagation phenomena on microwave line-of-sight links, 1785
Trost, A., with R. Berthold, G-M counter arrangement for X-ray interference measurements, 799
Truell, R., and J. A. Bronzo, ultrasonic-attenuation measurements in Ge, 2694
Truesdell, C., critical λ of ultrasonic waves in viscous fluid, 302
Truxal, J. G., and J. N. Warfield, synthesis of dynamically variable electronic filter, 2925
—— with R. S. Carlson, synthesis of compensation networks for carrier-frequency servomechanisms, 3115
Tsai, B., with others, thermomagnetic properties of haematite, 2705
Tsidil kovski, I. M., with K. B. Tolpygo, thermal rectification effect, 3015
Tsukkerman, P. I., nonoptical theory of focusing in rotating magnetic fields, 3580
Tubota, H., with others, temperature dependence of zero-bias resistance of Cu_2O rectifiers, 3345
Tucker, D. G., rectifier modulators, with frequency-selective terminations, input impedance of, 579, carrier-leak control in, 580; nonlinearity in voltmeter using cathode follower, 1746
Tucker, M. J., electronic square-law circuit for graphic recording, 346
Tukizi, O., frequency of scintillation fading of microwaves, 3098
Tung, S. P., solution of linear servomechanism by means of equivalent network, 550
Turkevich, J., with S. Larach, interaction of Mn activator ions in Zn_2SiO_4-Mn phosphors, 2323
Turlier, R., with G. Raoult, u.h.f. oscillations in triode valves, 2271
Turnbull, J. C., high-conductivity glass/metal seal, 142
Turner, D. R., analysis of waves containing harmonics up to twelfth, 1427
Turner, E. H., nonreciprocal waveguide medium using ferrites, 2922
Turner, F. T., and others, high-speed direct-scanning facsimile system, (A)841, 3730
Turner, L. B., two electronic resistance or conductance meters, (A)170
Twersky, V., multiple-scattering theory of finite grating, 695
Twiss, R. Q., e.m. propagation in electron-ion streams, 1316
Tyler, V. J., simple bolometer for dissipation measurements, 484
Tyminski, W. V., and A. E. Hylas, wide-band hybrid ring for u.h.f., 960
—— with A. E. Hylas, u.h.f. grid-dip meter, 2080

U

Ueta, M., field emission of crystalline phosphors, 3321
Uitjens, A. G. W., h.f. and i.f. television amplifiers, gain and bandwidth of, 1639, noise problems of, 1640, effects of feedback in, 1954
—— with C. J. Boers, line-timebase output stages with booster circuit, 2478
—— with others, new trends in a.m./f.m. receiver design, 2427
Ulrich, E. P., with others, evaporated-point-contact rectifiers, 2179
Uminski, S., harmonic distortion and negative feedback, (D)3253
Unger, H. G., plane reflectors for directive aerials, 936
Unwin, R. S., with H. G. Hay, tropospheric wave propagation duct of non-uniform height, 1471
Unz, M., high-resistance bridge for conductivity measurements, 3365
Urban, P., with E. Ledinegg, theory of waveguides, 1582; theory of forced oscillations in electrodynamic systems, 1622; first boundary-value problem of Maxwell's equations, 1641; bandwidth of cm-λ band-pass filters, 1935; susceptibility of linear antiferromagnetic chain, 2633
Urkowitz, H., ferroelectric amplifier, 1283
—— with T. S. George, noise in microwave superregenerative amplifier, 1846
Uyeda, H., studies on ionospheric storms, 2988
—— and Y. Arima, classification of F_2-layer storms, 2983
—— and T. Obayashi, field-strength calculations for long transmission paths, 2778
—— K. Miya and T. Kobayashi, frequency of occurrence of *f*Es and *fmin*F, 2985
—— and others, *h*'*t* ionosphere measurements at Wakkanai, Japan, during eclipse of 9th May 1948, 2659
—— with others, frequency-sweep $h'F_2$ measurements, 3297

V

Vaage, E. F., transmission properties of Clogston-type conductors, 2562
Vainshtein, L. A., and L. P. Malyavkin, alternating component in photocurrent under strong illumination, 3138
Vakin, S. A., propagation along helical slit, 3476
Valdes, L. B., measurement of minority-carrier lifetime in Ge, 741; electrode spacing and base resistance of transistors, 882
Valensi, G., compatible systems of colour television, 1815
Valeton, J. J. P., h.v. generators for projection television, 569
Valladas, G., and A. Leveque, background noise in ionization-chamber amplifiers, 1634
Vallarino, A. R., H. A. Snow and C. Greenwald, counter-circuit multiplex reciver, 3099
Valle, G., theory of discharge potential for coaxial cylindrical electrodes, 1655
del Valle, G. A., and L. W. Ferber, wear of magnetic heads, 2203
Vallet-Cerisier, L. A., coupling of cathode followers in d.c. amplifiers, 3252
Vander Sluis, K. L., with others, determination of velocity of light by band-spectrum method, 987
Vanet, P., with W. W. Jennings, direct-vision stereo-projection screen, 375
Vannel, —, with — Macelloni, control towers for civil aviation, 3419
Van Rennes, A. B., pulse-amplitude analysis in nuclear research, 639
—— with W. M. Grim, effects of grid/cathode capacitance in pulse-height selectors, 941
Van Winkle, D. M., with R. G. Shulman, pressure-welded Ge *p-n* junctions, 2352
Vasil'ev, E. I., and V. M. Lopukhin, theory of helix-type travelling-wave valve, 3453
Vasseur, J. P., diffraction by apertures in conducting screens, 718; distortion of f.m. wave, 2141
Vassilian, M., with C. Biguenet, gas-filled valves for industrial applications, 295
Vastel, J., 3·4 MeV linear electron accelerator, 2407
Vauthieu, P., numerograph, 1726
Vautier, R., magnetostriction of Co ferrites, as function of composition, 131, temperature variation of, 132
Vavilov, V. S., electron-optical investigation of photoconductive effects, 3606
Vawter, F. E., with others, scattering of 56-Mc/s radio waves from lower ionosphere, 2119; radio reflections from aurora, 3308

Vegard, L., advances in auroral spectroscopy, **1017**
Veinott, C. G., MONECA, a motor-performance calculator, **765**
Veith, F. S., with others, performance of vidicon camera tube, **249**
Veldkamp, J., with J. Bartels, international data on magnetic disturbances, first quarter 1952, **401**, second quarter 1952, **1340**, third quarter 1952, **1969**, fourth quarter 1952, **3285**
van Velthoven, T. M. W., c.r. oscilloscope, Type GM.5660, **3370**
Venema, H. J., shunt conductance of waveguide-fed slot, **823**
Venzke, G., sound absorbers for television studios, **3174**
Verhagen, C. M., survey of limits in d.c. amplification, **2277**
Verhoef, J. A., with P. van Tilburg, ferroxdure focusing unit for television picture tubes, **862**
Vermeulen, R., dimensional analysis, units and rationalization, **3584**
Vernier, P., optical and photoelectric properties of PbS layers, **2706**
Vernon, F. L., Jr, applications of microwave homodyne, **1741**
Vernon, T. V., with A. G. Milnes, saturable-core reference source for magnetic amplifiers, **2237**
Vernotte, P., successive differentiation of experimental curves, **2619**
Veronda, C., klystron pulse amplifier for 960–1215 Mc/s, **595**
Verweel, J., magnetrons, **1209**
Verzaux, P., transmission of radio waves through highly ionized gases, **3268**
Vestine, E. H., variations of geomagnetic field, and rate of earth's rotation 1338, **3281**
Veszi, G. A., modern single-layer Se photocell, **3449**
Vigean, F., alternating-field excitation of electroluminescent substances, [illegible]
Vigneron, H., measurement of characteristics of r.f. cable, **158**
Vilenski, I. M., theory of interaction of radio waves in ionosphere, **3095**
Villard, O. G., Jr, and F. S. Holman, electrically tuned *RC* oscillator or amplifier, **1638**
—— and A. M. Peterson, scatter sounding, a new ionospheric technique, **201**; extended-range communication in 15- and 20-m bands, **2421**
—— and others, transmission by reflection from meteoric ionization, **2117**
—— with others, double-Doppler investigation of meteor-trail echoes, **393**
Ville, J. A., analytical signals with limited spectrum, **2137**
—— with R. Roch, transmission parameters of a cable amplification section, **2559**
Villiers, —, radio aids to air navigation, **3419**
Vine, B. H., R. B. Janes and F. S. Veith, performance of vidicon camera tube, **249**
Visokovski, D. M., investigation on models of aerials with directors, **2893**; end-fire aerial arrays, **2901**
Visser, S. W., extrapolation of sunspot/climate relations, **3595**
Vitale, B., ionic equilibrium of lower atmosphere, **719**
Vitha, F. A., portable pulse test-set for coaxial cables, **3361**
—— with G. Thirup, measuring complex voltage ratios at 1–100 Mc/s, **2741**
van Vliet, K. M., with J. G. van Wijngaarden, l.f. noise in valves, **1192**
—— with others, l.f. noise in valves, **1202**
Vodar, B., with C. Feldman, conduction of Pt films covered with dielectric layers, **134**
—— with others, variation of resistance of thin metal films as function of applied potential, **3339**
Vodop'yanov, K. A., and B. I. Vorozhtsov, measurement of permittivity and loss angle at u.h.f., **3656**
Voge, J., e.m.-field fluctuations due to turbulence, at end of line-of-sight propagation path, **3394**; u.s.w. fading due to inversion layers, **3695**
Vogel, F. L., and others, observations of dislocations in Ge boundaries, **2693**
Vogel, T., mathematical theory of response of quadripole to discontinuous signals, **957**; boundary conditions for acoustic wave equation, **1894**; measurement of sound-absorption coefficient, **2197**
Vogt, E., with A. Elsas, reversal of sign of magnetostriction by expansion, **1711**
Voigt, G., automatic tuning in microwave receivers, **2130**
Voigt, H., measurement bridge for 0·1–1000 Mc/s, **782**
de Voogt, A. H., calculation of ray path in ionosphere, **3691**
de Vore, C., aircraft aerial fittings reduce precipitation interference, **2895**
Vorozhtsov, B. I., with K. A. Vodop'yanov, measurement of permittivity and loss angle at u.h.f., **3656**
Vos de Wael, L. R. M., direct-reading frequency-measurement equipment for the range 30 c/s–30 Mc/s, **171**
Voss, H. H., with G. Drexler, multistage band-pass filter, with optimum approximation to rectangular response curve, **1613**
de Vrijer, F. W., recent advances in colour television, **2162**
Vural, B., f.m. telegraphy on carrier-current telephone lines, **2434**

W

Wachowski, H. M., with R. E. Beam, shielded-dielectric-rod waveguides, [illegible]
Wachtler, M., with others, accuracy of c.r.o. direction finder, **1367**
Wada, H., with others, propagation characteristics of obliquely incident pulse waves during solar eclipse 9th May 1948, **2770**
Waddell, B. L., with others, digital to analogue converter, **148**
Wade, F., with E. E. Shelton, corona discharge tubes for voltage stabilization, **1136**, **(D)2803**
de Wael, L. R. M. Vos. See Vos de Wael, L. R. M.
Wagener, S., properties of oxide cathodes, **296**; sorption of gases at very low pressures by Th powder, **2675**
Wagner, H. M., cathode-interface impedance and its measurement, **3149**
Wahl, R., scale-of-ten counter using 4 double triodes, **2242**
Waidelich, W., logarithmic-scale electrometer, **3364**
Wainer, E., and C. Wentworth, niobate and tantalate dielectrics, **137**
Wait, J. R., radiation, from magnetic dipole in conducting medium, **39**, **2413**; reflection of e.m. waves from inhomogeneous medium, **1466**; loop aerial with spheroidal core, **1917**, **3491**; radiation resistance of small circular loop above conducting earth, **2905**; conducting permeable sphere near coil carrying a.c., **2986**; approximate method of obtaining transient response from frequency response, **3542**
—— and L. L. Campbell, fields of dipole in semi-infinite conducting medium, **2109**, **3202**; effect of large dielectric constant on ground-wave propagation, **2113**
Wakai, N., with K. Miya, characteristics of ionospheric disturbances during severe magnetic storms, **2987**
—— with others, field strength of scattered waves in r.f. propagation, [illegible]
Wakeman, R. P., experimental u.h.f. broadcast, **555**
Walchli, R., h.f. heating of metals, **1452**
Wald, S., low-cost variable phase shifter, **640**
Waldmeier, M., final relative sunspot numbers for 1951, **394**; provisional sunspot numbers, April–June 1952, **395**, July–Sept. 1952, **1325**, Oct.–Dec. 1952, **1984**, Jan.–March 1953, **3275**
Waldvogel, P., with others, Swiss developments in h.f. technology, **1548**
Walker, A. H. B., transductor control of rectifier output voltage, **839**; applications of Se and Cu_2O rectifiers in television receivers, **1502**
Walker, F. M., with others, c.r. tubes and valves for television receivers, **1521**
Walker, J. G., with R. M. Bozorth, magnetostriction of Co and Ni ferrites, **1399**; magnetic crystal anisotropy and magnetostriction of Fe-Ni alloys, **2345**
Walker, L. R., starting currents in backward-wave oscillator, **3752**
—— with H. Suhl, Faraday rotation of guided waves, **(C)1232**
Walker, P. J., loudspeaker in the home, **3469**
Walker, T. H., with A. T. Starr, design of microwave radio links, **217**
Wallace, R. L., Jr, L. G. Schimpf and E. Dickten, junction-transistor tetrode for h.f., **677**, **1184**
Wallis, C. M., design of l.f. constant-time-delay lines, **(A)1603**, **2920**
Wallmark, J. T., influence of initial velocities on electron transit time in diodes, **1193**; photographic study of space-charge spread of reflected electron beams, **2961**
Waller, H., with W. Kronjager, Rhine R/T service, **542**
Walsh, E. J., with G. T. Ford, high-transconductance tubes for broad-band telephony, **293**
Walsh, J., with E. D. Whitehead, radio telemetry, **1762**
Walter, R., simple model for directional action of two vertical radiators, **3308**
Walter, S., Type-A transistors in trigger circuits, **3516**
Walters, G. A., with R. J. Stahl, noise reduction in intercommunication systems, **2787**
Walters, L. G., regenerative loops in analogue computers, **3647**
Waltz, M. C., transients in pulse response of point-contact Ge diodes, **872**
Wang, An, high-speed number generator using magnetic storage matrices, **2370**
Wanlass, C. L., static-dynamic design of flip-flop circuits, **1602**
Wannier, G. H., motion of ions in strong electric field, **376**, **1649**
Warburton, J. A., with W. N. Christiansen, highly directional aerial system for scanning solar disk, **3209**
Ward, E. E., analogue computer for design of servo systems, **1055**
Ward, F. L., Helmholtz resonators in acoustic treatment of B.B.C. studio at Swansea, **309**
Warfield, J. N., with J. G. Truxal, synthesis of dynamically variable electronic filter, **2925**
Warham, J., effect of inductance on fine transfer between Pt contacts, **3495**
Warminsky, R., with I. Broser, electrical conductivity connected with phosphorescence of CdS crystals, **1026**, **1371**
Warnecke, R., and others, amplification by space-charge waves, **278**, oscillations in whole-anode magnetron related to, **904**
—— with others, new magnetron oscillator with interdigital circuit, **2187**
Warner, A. J., properties of 1N-420 chlorinated impregnant, **3633**
Warren, R. E., with others, frequency dependence of mutual conductance of aged oxide-cathode valves, **(A)2838**
Watanabe, H., with others, a.c. magnetization characteristics of a perminvar wire, **2703**
Watanabe, K., F. Marmo and E. C. Y. Inn, formation of D layer, **2652**
Watanabe, Y., with T. Nimura, effect of finite circular baffle on sound field of disk, **1555**
Wathen, R. L., early history of magnetron, **2851**
Watkins, D. A., and A. E. Siegman, helix impedance measurements using electron beam, **3753**
Watson, R. B., with others, reverberation chamber with polycylindrical walls, **922**
Watson, S. N., with others, test equipment for television transmission circuits, **1823**
Watts, A. J., with others, design of superheterodyne receiver for television, **1504**
Watts, C. B., Jr, simultaneous radiation of odd and even patterns by linear array, **40**
Watts, C. U., with R. C. Taylor, filter characteristics by direct method, **(A)961**, **3544**
Watts, J. M., oblique-incidence pulse propagation at 300 kc/s, **1474**
—— with others, ionosphere recorder for 50 kc/s to 1 Mc/s, **1998**
Waverling, E., printed circuits for home radio receivers, **354**
Wax, N., space-charge requirements in ideally focused electron-optical systems, **3384**
Waymouth, J. F., optical measurements on electroluminescent ZnS, **2023**
—— C. W. Jerome and W. C. Gungle, electroluminescence, **2956**
Waynick, A. H., with others, polarization of vertically incident long radio waves, **806**; long-delay ionospheric echoes at 150 kc/s, **1992**
Weaver, C. H., with D. W. Russell, synthesis of servomechanisms by root locations, **(A)2150**
Weaver, L. E., with A. H. Roche, television frequency-translating terminal equipment for the Birmingham/Holme-Moss coaxial cable, **1149**
Webb, E. L., with others, phosphor-photocell radiation detector, **1103**
Webb, H. D., with T. R. O'Meara, phase and gain stabilization in matched-channel receivers, **2320**
Webb, R. C., constant-resistance c.r. deflection circuits, **235**
Weber, A. P., investigations on oxide cathodes with interface layer, **2833**
Weber, D., with H. Schnitger, travelling-wave valve, experimental verification of theory of, **280**, for 15-cm λ, measurements on, **2499**, reduction of noise factor in, **3754**
Weber, J., quantum theory of damped electrical oscillator and noise, **3243**; amplification of microwave radiation by substances not in thermal equilibrium, **3593**
Weber, S., with W. Kluge, pulse irradiation of composite photocathodes, **3448**
Wechsung, H., d.c./a.c. converter using valve space-charge capacitance, **1806**
van Weel, A., radio navigational aids, **2996**; susceptance valves and reactance valves as phase modulators, **3442**; measurement of group-delay time in networks, **3659**
Wehner, G., and G. Medicus, probe measurements in hot-cathode gas diodes, **381**
Weidner, H., with others, resonance in electrodeless h.f. gas discharge in magnetic field, **85**
Weighton, D., with L. Lax, gamma-control circuit using crystal diodes, **1826**
Weill, G., with J. C. Simon, longitudinal radiation of dielectric aerials, **1244**
Weill, M. C., Ge in telecommunications technique, **1850**
Weinberg, L., synthesis, of network transfer functions, **1929**, of unbalanced *RLC* networks, **2256**, of *RLC* lattice networks, **3535**
—— and L. G. Kraft, measurements of detector output spectra, **3699**
Weintraub, S., slide-rule computation of atmospheric r.f. refractive index, **1914**
—— with E. K. Smith, Jr, constants in formula for atmospheric refractive index at r.f., **1990**, **3287**
Weir, E. V., operating principles of magnetic amplifiers, **332**
Weiss, A. A., solar tides in F_2 region, **1348**
Weiss, H., with H. Kleinwächter, consequences of amplitude spectrum in pulse technology, **3105**
Weiss, M. T., and A. G. Fox, magnetic double refraction at microwave frequencies, **755**
Weissman, R., high-speed counter uses ternary notation, **50**
Welby, B. G., computer-tape reader, **1418**
Welch, A. J. E., with others, structure and properties of ferrites, **2043**
Welch, E. E., with others, phosphors for television c.r. tubes, **1869**
Weldon, J. O., 1-MW a.m. broadcasting transmitter, **2176**
Welker, H., with O. Madelung, theory of mixed semiconductors, **2028**
Weller, F., with R. Schachenmeier, refractive index of dipolar gas mixtures at dm λ, **1612**
Wells, G. M., with A. Lindell, crystal valves, **264**
Wen Yuan Pan. See Pan, Wen Yuan.
Wendt, G., electron-beam deflection systems and their aberrations, **2842**
Wenk, P., and H. Boljahn, ultrasonic tinning of Al, **801**
Wentworth, C., with E. Wainer, niobate and tantalate dielectrics, **137**
Werner, G. L., and H. Berlin, medium-cost amplifier with good performance, **979**
Werner, P. H., mechanical properties of magnetic tapes and quality of recording, **20**
Werner, W., television reception and interference, **2173**
—— with F. Kerkhof, Television, **(B)578**
Wernholm, O., 35-MeV synchrotron, **2093**
v. Werthern, W., with F. Bath, carrier-frequency cable links, **2436**
Wessels, P. S., design of slug-tuned superheterodyne receivers, **528**
West, J. C., and D. K. Partington, phase-shifting pulse generator for thyratron control, **1629**
—— and J. Potts, relation between closed-loop transient response and open-loop frequency response, **3231**
West, W., with others, fundamental aspects of colour television, **1814**
Westell, E. P. L., reduction of radiation from carrier-current circuits on overhead power lines, **1794**
Westervelt, P. J., theory of steady rotational flow generated by sound field, **1552**, **(C)3166**
Westmijze, W. K., studies in magnetic recording, **3471**
Westpfahl, K., with R. Muller, diffraction of e.m. waves by slit, **1971**
Wettstein, E., apparatus for bulk tests of sheet iron, **3061**
Wetzel, W. W., with L. B. Lueck, performance of high-output magnetic tape, **1578**
Whalley, W. B., design of u.h.f.-v.h.f. television receivers, **1497**
—— C. Masucci and N. P. Salz, Ge diode as video detector, **2475**
Wheeler, H. A., skin-effect chart for conducting materials, **435**
Wheeler, L. K., and E. S. Trickett, measurement of spray particles, **3684**
—— with R. O. Carter, phototelegraphy transmitter-receiver using sub-carrier f.m., **559**
Whinnery, J. R., with C. K. Birdsall, waves in an electron stream, **2498**
—— with H. R. Johnson, travelling-wave-valve oscillators, **1872**, **(C)3750**, with electronic tuning, **3454**
Whitby, O., and D. R. Scheuch, output analysis and alignment techniques for phase-rotation s.s.b. transmitters, **2481**
White, A. D., with M. A. Lampert, microwave technique for studying gas discharges, **3263**
White, C. F., and K. A. Morgan, dual-input parallel-T network, **3587**
White, E. S., television-receiver a.g.c. systems, **1832**
White, H. P., Type-DM70 tuning indicator for battery or mains receivers, **3456**
White, J. E., with W. P. Bartley, alterations of characteristics of oxide-cathode valves, **3755**
Whitehead, E. D., and J. Walsh, radio telemetry, **1762**
Whitehead, J. D., quasi-transverse approximation to Appleton's magneto-ionic equation, **514**
Whitehurst, R. N., with others, radiation by fast electron beams, **3582**
Whiteley, T. B., and L. R. Alldredge, photomechanical wave analyser for Fourier analysis of transient waveforms, **1438**
Whitesell, W. J., with V. A. Johnson, theory of magnetoresistive effect in semiconductors, **2328**
Whitmer, R. M., radiation from dielectric waveguide, **322**
Wichmann, H., measurement of atmospheric electric field by radioactive probe, **1681**
Wick, R. F., with others, modulators and gyrators using Hall effect in Ge, **1930**
Wickizer, G. S., field strength of station KC2XAK recorded at Riverhead, N.Y., **1113**
—— and A. M. Braaten, field strengths at 93 Mc/s over distances of 40–150 miles, **809**
—— with others, v.h.f. transmission over mountainous path, **3396**
Wickline, B. D., with R. W. Ralston, television coverage of the 1952 National Political Conventions, **3134**
Wideröe, R., theory, development and applications of betatron, **3381**
Widl, E., noise measurements on telecommunication cables, **3182**
Wieder, H. H., and N. Cass, f.m. transistor oscillator, **2938**
—— and S. Kaufman, plastic electrets, **2025**, **3323**
Wiersma, R. A., voltmeter loading, **3653**
Wigan, E. R., diagnosis of distortion by means of 'difference diagram', **2383**
Wigner, E. P., with T. Teichmann, e.m. field expansions in loss-free cavities, **2268**
Wijn, H. P. J., h.f. melting of ferromagnetic semiconductors, $BaFe_{18}O_{27}$ ferromagnetic crystal, **752**
—— with others, measurement methods for properties of ferroxcube materials, **3060**
van Wijngaarden, J. G., and E. F. de Haan, l.f. noise in electrometer valves, **1185**
—— and K. M. van Vliet, l.f. noise in valves, **1192**
—— K. M. van Vliet and C. J. van Leeuwen, l.f. noise in valves, **1202**
Wild, W., U.v. Kienlin and H. Simon, aerial systems for 24-channel p.p.m. beam R/T system, **822**
Wilde, H., mutual-inductance bridge for measurements on ferromagnetic cores, **460**; h.f. wattmeter with dry rectifier, **1752**
Wilhelm, H. T., impedance bridges for megacycle range, **169**
Wilkes, M. V., 'floating address' system for digital computer, **1722**
—— and J. B. Stringer, micro-programming in digital computer, **2716**
Wilkinson, D. H., space-charge sheath in G-M counters, **798**
Willard, G. W., ultrasonic waves measure properties of polymers, **3072**
Williams, C. E., utility factor in circuit diagrams, **63**, **671**
Williams, E. J., and N. H. Kloot, interpolation in series of correlated observations, **2362**
Williams, E. M., with J. Kukel, helical-winding structures in exponential-line pulse transformers, **2234**
Williams, F. C., and G. B. B. Chaplin, design of transistor trigger circuits, **2914**
Williams, G. C., with F. L. Jones, low-pressure breakdown of gases in nonuniform fields, **2630**
Williams, H., with R. J. Halsey, Birmingham/Manchester/Holme-Moss television cable system, **1147**
Williams, H. J., magnetic domains, **749**
Williams, M. B., and D. Brookes, cable-fault indicator, **2392**
Williams, M. O., inertia effects in cold-cathode valves, **903**
Williams, P. B., with D. J. Plach, horn-loaded loudspeakers, **814**
Williams, R. B., Jr, continuous-indicating loran, **2319**, **2998**
Williams, R. C. G., industrial and professional applications of television technique, **1844**
Williams, R. W., and G. M. Parker, source of continuously variable voltage for computer, **1056**
Williams, W. E., Jr, high-power square-pulse generator, **1086**
Williamson, E. M., with H. T. Flint, relation of quantum theory to gravitation and electromagnetism, and application to theory of electron, **3570**
Willis, B. T. M., crystal structure and antiferromagnetism of CrSb, **3036**
—— and H. P. Rooksby, crystal structure and antiferromagnetism in haematite, **1311**
Wills, M. S., rotating-coil fluxmeter, **1430**
Willwacher, E., noise factor and its relation to sensitivity of superheterodyne receiver, **2127**; grounded-grid disk-seal triode; self-excitation with, **3245**, circle diagram for input admittance of, [illegible]
—— with H. Rothe, limiting sensitivity of amplifier valves, **1538**
—— with others, dm-wave beam radio equipment FREDA I, **2160**
Wilson, A. E., with L. J. Rueger, N.B.S. microwave standard-frequency service, **2063**
Wilson, L. T., with N. F. Roberts, counting pulses of various forms and occurrence intervals, **1257**
Wilson, T. A., with others, a.f.c. of high-power klystrons, **2942**
Wilson, T. G., series magnetic amplifier with inductive loading, **(A)338**, **3509**
Winch, G. T., aspects of colour rendering in television, **1818**
Winckel, F., energy spectrum of television image, **234**
Winslade, R., vibration measurements, **790**, **(D)2400**
Winter, A. J., effect of filament voltage on valve characteristics, **1866**
Winterling, K. H., measurement of resistances $> 10^{13}$ Ω, **459**
Witt, H., electrical fluctuation phenomena, **2288**
Witt, R. K., with others, r.f. properties of 16 insulating materials, **1716**
Witten, A. L., and R. E. Henning, wide-band waveguide recording reflectometer, **468**
Woerner, J. J., with others, high-power klystrons, **1213**
Wong, J. Y., radiation of slots in elliptical cylinders, **3482**
Wood, C. B. B., with A. V. Lord, variable-definition camera channel for appraisal of television standards, **1758**
Wood, J. E., with others, temperature variation of magnetization of Ni, **1033**
Wood, R., reliability of subminiature valves with filament cathodes, **3749**
Woods, J., and D. A. Wright, secondary emission from BaO, **896**, changes in, and in thermionic emission during electron bombardment, **2184**
Woodson, H. H., and C. V. Thrower, compensation of magnetic-amplifier servo system, **3114**
Woodward, J. G., and J. B. Halter, lateral mechanical impedance of gramophone pickups, **3181**
Woodward, O. M., Jr, balance measurements on balun transformers, **3663**
—— with G. H. Brown, radiation characteristics of conical and triangular aerials, **1238**
Woodward, P. M., information theory, **3101**
—— with others, electronic band structure of PbS, **2037**
Wooley, M. C., G. T. Kohman and W. McMahon, polyethylene terephthalate as capacitor dielectric, **440**
Woolley, J. C., with others, magnetic viscosity under discontinuous and continuous field variations, **123**
Woonton, G. A., diffraction field of circular aperture, **1294**
Worswick, T., and J. L. Bliss, television camera with optical view-finder, **856**
Wray, A. G., Q factor measurement, **775**; measurement equipment for f.m. systems, **3864**
Wray, D., unit for superimposing two television pictures, **2174**
Wray, W. J., Jr, *RC* oscillator, **(D)2604**
—— with L. Packer, Ge photodiodes read computer tapes, **454**
Wright, D. A., conference on microwave physics, Oxford, July 1952, **965**; survey of thermionic emitters, **2832**
—— with J. Woods, secondary emission from BaO, **896**, changes in, and in thermionic emission during electron bombardment, **2184**
Wright, R. W., with others, properties of ferrites at v.h.f., **1312**
Wrigley, W. B., moving poles in nonlinear oscillating systems, **2601**
Wu, Ta-You, with H. E. Moses, dissociation of O_2 in upper atmosphere, **182**

Y

Yaeger, R. E., with others, optical encoder and digit register using transistors, **786**, **2373**
Yakovlev, V. A., with A. G. Samoilovich, additional resistance of ferromagnetic metals, **1402**
Yamada, Sueharu, with others, networks with maximally flat delay, **(D)2259**
Yamaka, E., study of oxide cathodes by X-ray diffraction, **397**
—— and T. Sugita, energy-band structure in Si crystal, **3327**
Yamanaka, S., with Y. Koike, limiting frequency of triode oscillator, **1891**;

amplification constants of triodes, **1537**
Yanus, R. I., with V. V. Druzhinin, anisotropy of coercive force in single crystals of Si-Fe alloys, **2704**
Yates, J. G., with K. F. Sander, accurate mapping of e.s. fields in electrolyte tank, **2739**
Yeh, Chai, analysis of single-ended push-pull audio amplifier, **2613, 3251**
Yetter, W. P., with others, synthesis of paralleled 3-terminal *RC* networks, **3538**
Yonezawa, T., F_2-layer electron-density variations after sunset, **2656**; recombination-coefficient and temperature variations in F_2 layer at night, **2662**; mechanism of electron removal from F_2 layer, **3298**
Yorke, R., with K. R. McLachlan, objective testing of pickups and loudspeakers, **19**
Yoshida, S., and I. Takeda, secondary emission from oxide cathodes, **2836**
—— I. Takeda and H. Arata, dissociation of oxide-coated cathode, **2834**
Yosimoto, H., oscillatory phenomena in hot-cathode discharge tube, **2959, 2960**
Young, A. S., with V. Roberts, PbSe photoconductive cells in infrared spectroscopy, **3142**
Young, J. R., conductivity and thermoelectric power of (BaSr)O and BaO, **896**
Young, J. Z., with F. Roberts, flying-spot microscope, **1759**
—— with others, flying-spot microscope, **3073**
Young, W. R., Jr, mobile radio transmission at 150, 450, 900 and 3700 Mc/s, **823, 1795, 3711**
Youngmark, J. A., loudspeaker baffles and cabinets, **2201**
Yu, Y. P., highly stable variable time-delay circuits, **1261**
Yurkov, V., with others, electrical properties of Sb_2S_3 and Bi_2S_3, **3019**
Yvon, J., theory of ferromagnetism and Heisenberg's model, **1008**

Z

Zaayer, D., 100-kW television output stage, **3742**
Zackay, V. F., and others, fundamentals of glass-to-metal bonding, **2712**
Zadeh, L. A., optimum nonlinear filters, **2598**; theory of nonlinear 2-pole networks, **3220**; analysis of valve and transistor circuits, **3223**; a class of stochastic operators, **3348**; nonlinear multipoles, **3546**
—— and J. R. Ragazzini, optimum filters for detection of signals in noise, [illegible]
—— with J. R. Ragazzini, analysis of sampled-data control systems, **(A)1801**
Zakhaim, M., impedance transformation of folded dipole, **(D)3200**
Zakheim, J., power amplifier for driving low-power d.c. motor, **687, 2947**
Zavadovskaya, E. K., breakdown strength and mobility of charges in dielectric, **1375**
Zeluff, V., with J. Markus, Electronics for Communications Engineers, **(B)909**
Zemke, H. J., with H. Dippner, reverberation times of Berlin auditoria and sound-recording studios, **3467**
Zenner, R. E., with others, electronic function generator, **451**
Ziegler, H. K., optimum design of permanent magnets, **(A)3039**
van der Ziel, A., noise, shot, in semiconductors, **2040**, in gas discharges, **2185**, accuracy of measurement with square-law detector, **2724**; simple method for measurement of cathode interface impedance, **2839**
—— with W. W. Lindemann, flicker noise caused by interface layer, **1531**
—— with R. H. Mattson, shot noise in Ge filaments, **2035**
Zimmer, E., with H. Höhl, intensity and polarization of e.m. waves diffracted at slit, **3269**
Zingerman, Ya. P., with N. D. Morgulis, investigation of oxide cathode, **1527**
Zinke, O., current and voltage distribution, in cylindrical, ellipsoidal and conical aerials, **2568**, along rotationally symmetrical aerials, **(A)3195**
—— with J. Deutsch, screening of test rooms and instruments from e.m. fields, **3116**
Zirm, R. R., with others, microwave correlator, **1067**
van Zoonen, D., and G. Prast, Jr, properties of Ar-Br-filled counters, **1463**
Zwicker, E., limits of perception of a.m. and f.m. of pure tones, **303**
—— and G. Gässler, suitability of dynamic headphones for measurements on f.m. tones, **312**
—— and W. Kaiser, modulation threshold in audible range, **1892**
—— and W. Spindler, influence of nonlinear distortion on audibility of frequency vibrato, **2870**
Zworykin, V. K., present stage of development of television, **237**
Zyngier, H., with D. Blanc, application of Wilkinson's theory to G-M counters with external cathode, **3389**

SUBJECT INDEX

SYMBOLS (A) Abstract, (B) Book Review, (C) Note of Correction, (D) Discussion

A

Abacs, (See also Charts)
for capacitors for zero-temperature-coefficient oscillatory circuits, **954**
for computation of tropospheric refractive index, **1670**
for correction of *Q*-meter errors due to valve-voltmeter loading, **783**
Absorption, (See also Acoustics; Ionosphere)
acoustic, in granular media, **923**
by materials, measurement with directive transmitters and receivers, **12**, reverberation-chamber method of measurement of, **3466**, tube method for measurement of, **925**
by perforated bricks and rock-wool boards for television studios, **3174**
by rubber tank-lining materials, **1569**
in suspensions and emulsions, case of fog in air, **2547**
by tubular and hollow-brick resonators, **310**
acoustic and ultrasonic, in water and aqueous solutions of electrolytes, **2196**
coefficient, acoustic, comparative measurements and test specification, **1570**, as function of angle of incidence, **2548**, measurement of, **2197**, measurement of by long-tube method, **13**, measurement of by reverberation-time method, **3465**
in electron-gas mixture, **2297**
ionospheric, measurement of, **2661**
measurements and theory of, **1679**
observations at Calcutta, **3690**
of pulse signals, automatic measurement of, **1680, 2313, (D)3305**
of short waves, calculation of, **1351**, effect of geomagnetic field on, **1678**
microwave, of electrolytes, **698**
of O_2, line breadths in, **91**
of ND_3, spectrum lines of, **2298**
in polar liquids at 3 kMc/s, standing-wave method of measurement of, **2066**
ultrasonic, in animal tissues and plastics, **1562**
in liquids, and relaxation mechanism, **604**
in mixtures of ethyl alcohol and water, **1222**
of water-borne sound, by resonance-type materials, **308**
Accelerometers, $BaTiO_3$-ceramic, **2399**
Acoustics, (See also Absorption; Broadcasting studios; Impedance; Sound; Ultrasonics)
anechoic chamber at Technische Hochschule, Karlsruhe, **1889**
artificial ears for calibrating telephone receivers, comparison between, **1888**
of auditoria, design problems of, **3175**
of auditorium designed for technical meetings, **610**
bibliography, **1, 910, 1549**
of broadcasting studios, Swansea, Helmholtz resonators for improvement of, **309**
of Cologne broadcasting centre, **3468**
damping of pulsating air bubbles in water, measurement of, **2534**
of halls, analysis of transient effects by means of models, **921**
ceiling treatments in relation to reverberation times, **1896**
diffusion in, **1893**
impedance tube, resolving power of, **2867**
improvements in Vienna church of St. Anthony of Padua, **14**
musical scale, measurement of intervals of, **1887**
musical tone, complex, 3-dimensional representation of, **1219, 3462**
problems at Waldbuhne open-air theatre, Berlin, **1573**
properties of building materials, comparative measurements on, **311**
radiation pressure and dispersion, **1565**
reverberation chamber with polycylindrical walls, **922**
reverberation times, of Australian concert halls, **3176**
of 52 Berlin auditoria and sound-recording studios, **3467**
of rooms, boundary conditions for wave equation, **1894**
c.r.o. display for reverberation-time measurements, **307**
effect of wall shape on, **2872**
improvements in absorptive linings, **1567**
measurements of, methods and apparatus for, **606**
and quality of loudspeaker reproduction, **3469**
reverberation-time measurement accuracy with warble tones and with white noise, **1571**
of Royal Festival Hall, London, **2198**
of theatres, sound-delay system for improvement of, **1572**
Acousto-electric effect, **2281**
Aerial Arrays, broadside, helix, radio-astronomy, at Ohio State University, **3490**
curtain-type, power gain of, **1909**
end-fire, **2901**
optimum design of, **2225**
high-gain, for television broadcasting, **1236**
linear, broadside, slotted-waveguide, with simultaneous odd and even radiation patterns, **40**
for minimum width single beam end fire pattern, **2571**
optimum design of, **1594**
shunt-slot, effects of dimensional errors on performance of, **1592**, factors affecting performance of, **1241**
multiloop, stagger-tuned, for wide-band loran reception, **3207**
radiation pattern of, analogue computer for, **3198**
ring type, comprising tangential or radial dipoles, **2570**
slotted waveguide, second-order beams of, **1914**
with symmetrical conductance functions, **2903**
u.h.f., mobile, **2222**
Aerials, (See also Lenses, microwave; Transmission lines; Waveguides)
and aerial arrays, mutual radiation resistance of, **32, (D)627**
Aerials, aircraft, fittings for reduction of precipitation interference, **2895**
'artificial-slot', using high-permeability dielectrics, **1916**
conical and triangular, radiation characteristics of, **1239**
corner-reflector, radiation diagrams of, **2224**
cylindrical, ellipsoidal and conical, current and voltage distribution in, **2568**
solution of Hallén's equation for, **1908**
theory of, **(D)629**
thick, input impedance of, **1235**
dielectric, u.h.f., comparison of disk with other types, **2396**
dielectric-disk, **2572**
dielectric-rod, **325**
longitudinal radiation of, **1244**
polystyrene and lucite, **3479**
dielectric spiral round magnetic rod, **1942**
dipole, cylindrical, gain and back-scattering cross-section of, **(D)2894**
horizontal, in dissipative medium, theory of radiation from, **1587**
with tuned parasitic radiator, **(D)324**
directive, beam shaping for, theory of, **31**
conical-helix, radiation field of, **2899**
using convex waveguide-lens, theory of, **3204**
gain of, approximate formulae for, **635**
loop, using ferroxcube rods, **939**, small, radiation resistance of, **2905**
microwave, with plane reflector, analysis for, **1243, 1913**, reflectors for, side-lobe analysis for, **41, (C)2226**
with parabolic reflectors, characteristics in absorbing media, **3206**, with very good matching, **326**
with passive directors, investigation using small-scale models, **2893**
plane reflectors for, **936**
rhombic, coplanar, coaxial, mutual impedance of, **3197**, free-space radiation impedance of, **2898**, receiving, design of, **2223**, receiving, vertical pattern of, **1912**
rotating Adcock, null characteristics of, **2906**
two-mast, medium-wave, design and performance of, **2227**
wide-band, u.s.w., **636**
discone, design of, **3196**
earthing system, radial-conductor, design of, **(C)42**
feeders for, coaxial, developments in, **2210**
losses in, **2211**
flush-mounted, for military aircraft, **634**
folded-dipole, impedance transformation of, **(D)3200**
input impedance of, **3488**
with two or more elements, impedance transformation of, **1234**
Hallén's integral equation for, difficulties with present solutions of, **633**
helical, beam, for citizens' radio, **1593**, performance of, **3489**
high-resolution, for scanning the solar disk, **2573, 3209**
horn, e.m., gain of, **935**, with phase-correcting lenses, **1242**
impedance of, measurement of, **630**
lens, for cm λ, survey of, **3203**
linear, theory of, **3201**, calculation of some definite integrals in, **1238**
loop, for interference elimination in long-wave reception, **35**
for portable receivers, **3481**
receiving, with hollow prolate-spheroidal core, **3491**, with spheroidal ferromagnetic cores, gain of, **1917**
small, measurement of radiation resistance of, **327**
mutual impedance of, simplified calculation of, **3199**
portable 200-ft Al-alloy mast, **3194**
radar, moulded plastic reflector for, **1911**
parabolic, with rotating beam, **1245**
wide-angle-scan, using Schmidt system, **938**
radiation patterns of, c.r.o. display of, **3069**
receiving, cylindrical-wire, back-scattering from, **36**
short, theory of, **628**
rotationally symmetrical, current and voltage distribution along, **(A)3195**
sloping-V, nonresonant, distant field of, **3205**
slot, for f.m. altimeter, **2897**
waveguide-fed, radiating into parallel-plate regions, **1915**, shunt conductance of, **323**
slotted-cylinder, double-slotted, horizontal radiation diagrams of, **2228**
of elliptical cross-section, radiation from, **3482**
straight, theory of, **2220**
thin, carrying harmonic currents, mutual impedance of, **2569**
straight-wire, radiation resistance of, **1588**
switching system for, **33, 933**
television, receiving, **1590**, theory and design of, **1237**
transmitting, B.B.C., **934**, emergency, WJZ-TV, on Empire State Building, **631**, high-power, modern, **632**, suspended feeders at Kirk o' Shotts and Wenvoe, **34, 929**, u.h.f., using slot arrays, **2900**
transmitting, combined, for television and f.m. broadcasting, on Empire State Building, **1589**, for television and u.s.w. broadcasting, **37**
for U.S. Navy 14·5–35-kc/s transmitter, **821**
vertical, double, directional action of, **3208**
ground-reflection phase-error of, **2221**
v.h.f., impedance of, measurement of, **1432**
measurement of radiation patterns of, **3480**
Alloys. See Ferromagnetic materials.
Altimeters, f.m., nonquantized, **3311**
Ammeters, calibration at frequencies > 100 Mc/s, **1075**
Amplification, d.c., limits of, survey of, **2277**
of microwave radiation by substances not in thermal equilibrium, **3593**
by space-charge waves in electron beam in crossed e.s. and e.m. fields, **278**
Amplifiers, (See also Circuits; Television)
a.f., bypass and decoupling circuits for, design of, **2614**
constant-current, design of, **1635**
differential input stage for, **2616**
feedback, Type-PM53, for sound reproducers, **3567**
gramophone-pickup, with adjustable response curve, **315**
high-power, **2948**
input circuits for, **2615**
medium-cost, with good performance, **979**
negative-feedback tone control for, **64**
noise in, **368**
pentode output stages of, performance of, **1636**
power, for constant-current Class-A2 operation, **2609**, 'Maestro', **978**
push-pull, single-ended, **3250**, single-ended, analysis of, **2613, 3251**, using transistors, **3521**
a.g.c., using NTC resistors with heater, **1953**
cathode-follower, design charts of, **3565**
cathode-follower circuits as high-impedance input stage for, **367**
class-B, avoidance of grid current in, **3249**
constant-volume, using cathode-follower circuit, **365, (D)686**
d.c., cathode-drift compensation in, **(A)2617**
coupling of cathode followers in, **3252**
high-gain, **172**
high-sensitivity, with crystal contact breaker, **787, 2395**
high-speed, using moving-coil galvanometer, **1090**
with low-pass feedback network, **369**
based on magnetic modulator, **72**
for measurement of pH, **3683**
with negative feedback, **1950**
parallel-T, low-drift, wide-band, **982**
valve, **981**
for voltages down to 10^{-9}V, **2276**
dielectric, using ferroelectric capacitor, **1283**
mathematical analysis of, **70**
differential, for discriminating against push-push signals, **(D)1637**
distributed, mutual-inductance-coupled, **1284**
wide-band, theory of, **2612**
for driving low-power d.c. motor, design of, **687, 2947**
feedback, design of, **988**
h.f., tuned, using transistor tetrode, **677, 1184**
l.f., 1–3-c/s, **2950**
line and flat-gain, for L3 coaxial-cable system, **3411**
line and terminal, for Birmingham/Manchester coaxial cable, design of, **977**
'lock-in', using square-wave generator, **2608**
magnetic, analysis of, use of flux-charge concept in, **337**
balance-detector type, principles and applications of, **3504**
basic operating principles of, **332**
classification of, **2911**
comparison of methods of analysis of, **2910**
control of, **3507**
dynamic characteristics of, **2579**
effective feedback ratio of, **3510**
figure of merit of, **(A)2580, 2912**
half-wave, for servomechanisms, **(A)3724**
with high input impedance, **336**
high-speed, **3512**
low-input-power, **333**
'Magamp', and industrial applications, **945, 1095**
mechanics of, **3503**
parallel-connected, with inductive load, analysis of, **1251**, with resistive loads, analysis of, **(D)944**
priority of French publications on, **(D)943**
with reset control, **2581**
rules of similitude for, **334**
and saturable reactors, bibliography on, 1887 to mid-1951, **3506**
self-balancing potentiometer type, **3511**
self-saturated, half-wave, control characteristics of, **3505**
self-saturating, steady-state analysis of, **2235**
series-connected, idealized, analysis of, **3508**, with inductive loading, **(A)338, 3509**
single-core, as computer elements, **3048**
theory of, **2909**
transient response of, **2236**
transistor-controlled, **3211**
with voltage feedback, optimum input-winding resistance of, **3210**
3-phase transductor circuits for, **949**
60-c/s, application to position-indicating servomechanism, **335**
negative-feedback, harmonic distortion in, **2278**
using pentode, equivalent-circuit analysis of, **2611**
for relaying television signals over coaxial cables, **984**
noise/signal ratio of, methods for reduction of, **976**
photocell, stable-gain, **692**
power, cavity-type, design of, **2949**
proportional, reproduction of voltage pulses by, **691**
pulse, analysis of response to rectangular wave, **3566**
ionization chamber, background noise in, **1634**
use of gas-filled triode in, **2274**
push-pull, class-A, distortion in, **2610**
integrating, for c.r.o. recording of magnetic flux, **3062**
RC, feedback, with electronic tuning, **1638**
Amplifiers, *RC*-coupled or direct-coupled output stage of, analysis of, **1286**
selective, Wien bridge as frequency-determining element in, **1951**
10-c/s–10-kc/s, for null measurements, **1633**
superregenerative, microwave, noise in, **1948**
transistor, cut-off frequency of, **689**
formulae for characteristics of, **1601**
noise in, **1288, 2279**
transient response of, **3513**
variation with frequency of parameter values, **3518**

video, amplification and bandwidth of, 69
amplitude and phase distortions in, relations between, 980
effective bandwidth of, 1947
very-wide-band, 2275
wide-band, feedback-pair, 366
for weak photoelectric currents, 329
wide-band, compensated, design of, 1949
voltage ratios of, measurement of in range 1–100 Mc/s, 1735, 2731
Analogies, between acoustic and e.m. phenomena, 911
electrical and mechanical, 988, 989
Analysers, frequency-spectrum, a.f., heterodyne-type, (D)776, heterodyne-type, with mechanical filter, 1227, selective, 2073
for arbitrary function of short duration, 160
mechanical, for pulse series, 3641
harmonic, photomechanical, for transient waveforms, 1439
pulse-amplitude, compensation against grid/cathode capacitance effects in, 941
new design of, 1920
for nuclear research, 639
stability and equality of channel widths in, 2230
Analysis, complex-frequency, using phase principle, 918
dimensional, and rationalization, 3584
frequency, of acoustic phenomena, 1886
spectrum, narrow-band, of p.p.m. signal, 470
Antiferromagnetism, and crystal structure, of CrSb, 3036
properties of CoO and MnO mixtures, 2343
structure deformations in CoO and MnTe, 3035
survey of, 706, 3585
zero-point susceptibility of linear chain, 2633
Astronomy, radio, 92, (See also Cosmic radiation; Solar radiation)
broadside aerial array at Ohio State University, 3490
radio stars, determination of position of, 1329, interferometer measurement of diameter of, 1330, occultation of by solar corona, 98, possible radiation mechanisms of, 1328, scintillation of during aurorae and magnetic storms, 396
Atmosphere, (See also Ionosphere; Troposphere)
correlation of pressure fluctuations with solar activity, 1323
electric-equilibrium layer, height of, 1343
lower, ionic equilibrium of, 719
microwave refractive index of, constants in formula for, 1990, 3287
measurement of variations of, 1085
rapid variations of, 431
slide-rule computation of, 1014
ozone in, density and mean temperature of, annual variation of in Afghanistan, 2979
formation and distribution of, 1015
vertical distribution of, 2649
upper, continuous layer formation in, effect of solar radiation on, 2651
dissociation of O_2 in, 102
effects of solar radiation in, 1321
electrical conductivity of, and diurnal variations of geomagnetic field, 2647
over India, physical properties of, 403
investigations of, and auroral spectroscopy, 1017
photochemical reactions in, 1342, and relation to temperature, 1344
vertical distribution of nitrogen in, 402
between 80- and 250-km height, physical properties of, 3288
Atmospheric electricity, e.s. field at Khartoum during solar eclipse, 25th Feb. 1952, 104
in foggy conditions, 1355
measurement of field by radioactive probe, 1681
potential gradient, 1354
Atmospherics, mean level of, and intelligibility of km-λ radio link, 105
meter for, 'ogiver', 1443
observation stations, list of, 3100
propagation of, theory of, 1108
with very low-frequency components, 2771
Attenuators, cut-off, for waveguide circuits, 1938
magnetically-controlled, u.h.f., 1937, characteristics of, 964
waveguide, inductive, using properties of waveguide below cut-off, 2599
Audiometers, at Technische Hochschule, Stuttgart, 1891
Aurora, in Canada, orientations of, 3307
electron densities in and radio echoes from, 1999
and geomagnetic storms, theory of, 1013
35- and 74-Mc/s pulse echoes during, 2976
location with 10-m radar equipment, 728
radio echoes from, 3308
geometry of, 1357
at 33 Mc/s, long-duration, 2000
and scale-height determinations, 3309
southern zone as defined by homogeneous arcs, 3310
spectroscopy of, and investigations of upper atmosphere, 1017
theory of, 1356, 1358

B

Barretters, commercial, new, 646
Batteries, accumulator, Ag/Zn, 3728
Pb-acid, addition agents for negative plates of, 2157, 'Porvic' separators for, 2156
dry, Leclanché type, reactivation of, 3117
recent developments in, 3727
Beacons, See Navigation aids.
Bolometers, for direct measurement of r.f. power dissipation, 484
Book notices and reviews, Advanced Antenna Theory, 940
Antennas, Theory and Practice, 637
Automatic Feedback Control, 840
The Design and Analysis of Experiments, 1419
Electrical Measuring Instruments, Part 1, 2398
Electronics for Communications Engineers, 909
Filter Design Data for Communication Engineers, 1955, 2280
Harmonics, Sidebands and Transients in Communication Engineering, as studied by the Fourier and Laplace Analyses, 3719
Information Theory and its Engineering Applications, 2795
Landolt-Börnstein Zahlenwerte und Funktionen aus Physik, Chemie, Astronomie, Geophysik und Technik, Vol. 3, Astronomie und Geophysik, 1359
Photoconductivity in the Elements, 2358
Radio Amateur's Handbook, 30th edn, 2530
Radio Interference Suppression, 818
Radio and Radar Technique, 2854
Radio Research Special Report No. 23, Characteristics of the Ionosphere observed in Great Britain, 1930-1946, 2670
Radio Research Special Report No. 25, Materials for Radio Purposes, 2359
Radio Research 1952, 2468
Radio Spectrum Conservation, 2446
Television, 578
Vacuum Tube Oscillators, 2618
Breakdown, in air, H and He at low pressure in nonuniform fields, 2630
of gases, secondary processes in, 997
time lags in, 3262
h.f., of gases, theory of, 83
in Ne, 702
recent information on, 3632
spark, dependence on humidity and time, 2290
u.h.f., of gas subjected to crossed electric fields, 3261
Bridges, a.c., balance approach in, 1434
d.c., null detector for, design of, 3665
for dielectric measurements from 100 kc/s to 1 kMc/s, 782
high-resistance, for measuring conductivity of ground, 3365
impedance, h.f., with variable ratio arms, 1433
precision, for frequencies up to 20 Mc/s, 169
for measurement of admittance parameters of junction transistors at 1 kc/s–1 Mc/s, 3359
mutual-inductance, for measurements on ferromagnetic cores, 460
phase, for c.r.o. display of distortion in television apparatus, 2391
r.f., for measurement of low admittances, use of thermistors in, 1748
thermistor, for measurement of power at λ 3 cm, 1749, (D)2740, (D)3366
Wheatstone, for admittance determinations, (A)3367
Wien, and applications, 479
as frequency-determining element in selective amplifiers, 1951
Broadcasting, B.B.C. equipment for outside broadcasts, 224
British, future of, 2445
centre, Cologne, architectural acoustics of, 3468, supervision of electroacoustical equipment in, 3717, technical arrangements, 3716
low-frequency, Pierre Bourdan, Paris, 825
m.f., influence of ionosphere on, 3096
studios, auxiliary circuits in, 223
installations for, and new S.F.R. equipment, 826
Swiss organization of, 1123
and television, Radio Canada building, Montreal, 221
u.s.w., coverage problems of, 2139
planning of, 2789
service-area estimation, under conditions of interference, 214, and system planning for, 213
——**stations**, on the Hoher Meissner, North Hesse, 222
medium-wave, s.w. and u.s.w., N.W.D.R., 2148
small, private, in Germany, transmitters and studio equipment for, 2178
Wavre-Overijse, transmitting equipment at, 1128

C

Cables, coaxial, attenuation of, measurement of in range 1 Mc/s–4 kMc/s, 2072
characteristic impedance of, unit-step signals for determination of, 2732
with disk insulator, characteristics of at frequencies > 1 kMc/s, [illegible]
with helical-strip insulation, characteristics of at frequencies > 1 kMc/s, 3184
noise-free, production of, 2878
pulse deformation in, theory of, 1905
reflections due to impedance irregularities in, 2730
r.f., with liquid dielectric, 3472, measurement of characteristics of, 158
for television links, factors affecting performance of, 928
transmission parameters of, 2559
fault-location by pulse-echo methods, 2727
with nonuniform characteristic impedance, pulse response of, 2070
star-quad, without coils, for broadcast programmes, tests on, 1578
telecommunication, noise measurements on, 3182
Cables, of Verwaltung für Installationen, Kabel, Apparate, 617
wide-band, fault location by pulse-echo method, 2728
Calculating machines. See Computers.
Cameras, (See also Television)
100000 frames/sec, developed at Battelle Memorial Institute, 2056
Capacitance, of circular annulus, calculation by subarea method, 2302
of cube, calculation of, 2639
Capacitors, fixed, developments in, review of, 953
with high-ε dielectric, stray capacitance in, 3217
metallized-impregnated-paper, high-temperature operation of, 345
metallized-paper, 344
mica, l.f. power factor and capacitance of, 1925
nonlinear, titanate, 2916, properties and applications of, 2915
r.f. characteristics of, (D)51, 2244
Russian notation for value of, 2927
vacuum, development of, 52
for zero-temperature-coefficient oscillatory circuit, abac for, 954
Carrier-current systems, (See also Telegraphy)
analysis of build-up process in, 1249
calculation of transients in, 2246
cable links for, German, 2436
coaxial-cable, L3, 3409, amplifiers for, 3411, equalization and regulation in, 3410, television terminals for, 3424
nonlinear filtering and waveform multiplexing for, 670
power-line, frequency-shift, oscillator and discriminator for, 1482
noise in, 3705
transmission factors for, 3704
telephony, terminal equipment for, 1121
for Weser-Ems power-supply network, 2435
Cathode-ray oscillographs, automatic trace brightening for, 3369
beam intensifier for, 162
with delayed-trigger timebase circuit, for television waveforms, 1438
frequency markers and scales for, 1077
h.v., cold-cathode, 2743
for interference measurements in aircraft, 2075
for investigation of transients in heavy-current equipment, 3371
for television-waveform display, 2745
time marker, decade, dekatron, 771
for transistor characteristics, 784, 1437
trapezoidal distortion in, 2742
for vector representation of sinusoidal voltages, 3372
for 1–300-μs pulses with repetition frequencies up to 10^4/sec, 3667
——**oscilloscopes**, with e.s. deflection, for 100-kV pulses, 3067
Type GM5660, 3370
——**tubes**, (See also Counter tubes; Television)
constant-resistance deflection circuits for, 235
deflection-coil design for, 1834
flying-spot, new phosphors for, 3608
life testing of, 1444
positive- and negative-ion formation in, 2846
screens of monomolecular thickness for, preparation of, 3761
storage-type, direct-viewing, bright-trace, 3760
graphechon, improved, 1539, 2845
reduction of read-around ratio in, 3353
single-gun, improved, 1868
Cathodes, (See also Electron emission)
BaS, properties of, 893
capillary, metal, 3148
disk-type, improvements in, 898
dispenser-type, 'impregnated', 2502
filament-type, thermal time constant for, 282
oxide, BaO, activation of, photoconductivity study of, 1529, dissociation caused by primary electron bombardment, 2834, luminescence and thermionic emission of, 1712
BaO and (Ba,Sr)O, conductivity and thermoelectric power of, 896
(Ba,Sr)O, dependence of thermionic emission on wavelength of illumination of, 284
BaO-on-W, methods of preparation of, 1189
base alloys for, double activators in, 3152
conductivity of, 894, retarding-potential method for measurement of, 2835
effect of impurity migrations on, 1858
effects of oxygen on electrical properties of, 1190, 2503
experimental investigation of potential gradient in coating of, 1527
in gas discharges, spectroscopic investigation of, 1188
interface impedance of, effects in television receivers, 2505, measurement of, 2839, 3149
with interface layer, investigations on, 2833
interpretation of Nijboer's theory for, 2504
pulsed emission of, decay and recovery of, 285
review of investigations on, 1528
secondary electron emission from, 2836
semiconductor properties and performance of, 286
and semiconductors, 1859
thermionic emission and conductivity of, relation between, 3455
thoria, 2506, 2507, 2508, 2840, measurements relating to filaments of, 3151
W-filament, experimental investigation of emission from, 1857
X-ray diffraction method for study of, 397
oxidized Ni and W, field emission of electrons from, 1962
photoemissive, Cs-AgO, changes during heat treatment, 3447
Cs-Sb, 416, various, 2824
relation between sparking phenomena and surface e.s. field, 292
square-cage filament, equivalent diameter of, 3153
wire, temperature distribution at ends of, 283
Charts, (See also Abacs)
for attenuation of seven commonly used ladder-filter sections, (A)961, 3544
for bandwidth of λ/4 matching sections, 30
for cathode-follower amplifiers, 3565
for coaxial-line probe measurements, 458
for design of planar triodes, 2514
for skin effect in conducting materials, 435
for solution of sky-wave problems, 1469
for use in high-Q measurement, 464
for winding data of dust-cored coils, 647
Chronographs, recurrent sweep, 3068
Circle diagrams, for certain types of network, 43
for input admittance of grounded-grid disk-seal triode, 3564
Circuit diagrams, standardized layout for, 3492
utility factor in, 63, 671
——**theory**, (See also Networks)
Ohm's law for build-up phenomena, 638
pass band, general definition of, 3534
relation between width of and transient distortion, 3539
resonance characteristics by conformal mapping, 53
Circuits, (See also Networks)
a.f.c., lock-in performance of, 1280
anode-follower, derivatives of, 658
antiresonant, electronic, 2591
and assemblies, etched, plug-in, for computers, 2263
cathode-follower, with capacitive load, (D)1285
as high-impedance amplifier input stage, 367
RC, 662
theory and design of, 3247
combining, for connecting transmitters to common aerial, 870
correction, design of, 1450
counter, decade, gated, 1256
for random pulses, 1257
coupled, natural frequencies of, equations for, 1276
coupled inductively, double resonance in secondary of, 1620
equivalent, for three-pole and multipole networks, 2247
feedback, relation between closed-loop transient response and open-loop frequency response of, 3231
use of signal-flow graphs for analysing, 3531
using ferrite magnetostrictive resonators, 2229
ferroresonant, automodulation in, 1270
flip-flop, Eccles-Jordan, design of, 952
for l.v. operation, design of, 1602
triode, design for long-term stability of, 3558
impulse-governed-oscillator (I.G.O.), Type-E80T beam-deflection valve in, 2817
LRC, with nonsinusoidal voltage, power in, 1259
multivibrator, bistable, design of, 1946
negative-resistance, transistor, analysis of, 641
nonlinear, effects in, and applications of, 2273
series, subharmonics in, 2929
oscillatory, amplitude stability in, 3242
damped, field quantization applied to, 3243
LC, temperature compensation of, 2603
parallel-tuned, periodically switched to d.c. source, analysis of, 65
relation between susceptance slope and selectivity, 2928
response of, to linear-frequency-sweep voltage, (D)2930, to 'ramp' voltage, 2265
including temperature-dependent elements, 68
with variable inductance, transient phenomena in, 3551
3-dimensional locus curves for, 2266
including overdriven valves, graphical analysis for, 356
phase-delay, wide-band, waveguide, 3192
printed, production of, auto-sembly technique for, 355, 3548, plating method for, 354, Technograph etching system for, 353
for transistors, 674
unit assemblies for television, 352
printed and potted, 2926
using quartz-crystal, as f.m. oscillator and discriminator, 1277
RC, with voltage gain, 663
resonant, *RLC*, action of train of pulse signals on, 3241, in series, response to e.m.f. whose frequency is a linear function of time, 1941
spontaneous voltage fluctuations in, 676
response to f.m. signal, and analogy with a.m., 3246
scaler, ferromagnetic, 1255
square-law, for use with graphic recorder, 346
switching, high-speed, bistable, 648
transistor, 652, 3515, graphical analysis of, 653
time-delay, variable, highly stable, 1261
transconductance-bridge, for frequency elimination, 59
transistor, and applications, 3213
complementary-symmetry, 3519
matrix representation of, 642
theory of, 3520
with transformers, 1287
trigger, for cold cathode counter tubes, 49
transistor, 651, design of, 2914
using Type-A transistors, 3516
valve, without anode supplies, 685
applications of tensor theory to, 659
grounded-electrode, analysis of three types of, 1632
novel, 2600
triode, transformations of, 3529
valve and transistor, simplified analysis of, 3223
Classification, decimal, universal, explanation of principles of, 2520
Clocks, atomic, and frequency stabilization, (D)1422
quartz, of Greenwich time service, 3354
Clutches, moving-coil-actuated, 1094
Coders, feedback, for analogue to digital conversion, 3414
Coils, choke, for airborne power supplies, design of, 1924
for communication equipment, with ferrite cores, design of, 1923
dust-cored, charts for winding data of, 647
with ferrite cores, copper eddy-current losses in, 3526
helical, in dielectric supports, attenuation of, 1523
single-layer, calculation of parameters of, 1922
toroidal, powder-core, moisture aging of, 2355
Communication, theory of, analytical signals with limited spectra, 2137
application, to telecommunications and radar, 1792, to telecontrol and measurements, 1481
autocorrelation from ergodic hypothesis, 535; calculation for teletype signals, 537
comparison of channel capacity of a.m. and ph.m. systems, 2786
concept of entropy in, 536
correlation v. linear transforms, 1477, (D)3701
ideal coding for redundancy, 1478
introduction to, 3101
limits on information content of e.m. signal, 2135
prediction of nonstationary stochastic processes, 445
research on, problems and methods of, 1479
statistical, introduction to, 819
statistical equivalent of optimum transducers, 3700
——**equipment**, (See also under individual subjects)
beam radio, dm-wave, FREDA I, 2160, Swiss developments in production of, 1548
f.m., transportable, microwave, for military purposes, 1127
microwave, multiplex, Types FR and FJ, 3107
multiplex, time division, 212
and navigation aids, aboard merchant ships and fishing vessels, 3418
24-channel, p.p.m., input circuit and i.f. amplifier of, 1483
——**systems**, (See also Carrier current systems; Radio links; Radiotelegraphy; Radiotelephony; Relay systems; Telegraphy; Telephony)
air/ground, radio-link system, 3715
'ambiguous index', 2433
for civil aviation, 1024, [illegible]
installations at French overseas aerodromes, 3419
on German railways, 216
harbour radio, v.h.f., German, 1487
on Indian railways, 1122
linear, optimum transfer characteristics of transmitter and receiver for, 2136
mobile, channel spacing for, choice of, 3714
f.m., multi-station, for Ayrshire police, 1129
frequency-band economy in, 1797, 3713
m.f., bibliography on, 3407
R/T service in Belgium, 3718

split-channel system for, at 50 Mc/s, field test of, **3709**, at 50 Mc/s, operational experience of, **3710**, at 152–174-Mc/s, **3102**, **3706**, at 156·3 Mc/s, tests in Syracuse, **3707**

20-kc/s split-channel system for, at 160 Mc/s, commercial experience with, **3708**

tests on frequency bands for, **823**, **1795**, **3711**

multiplex, frequency-division, distortion reduction in, **2788**

subcarrier bandwidth and response speed of, **3103**

time-division, **1793**

p.c.m., 12-channel, experimental, **1125**

p.p.m., directional, performance figures for, **2146**

radio services of West German Post Office, **539**

in Swiss army, development of, **1118**

telephony and telegraphy, between Turkey and the West, **2143**

v.h.f., multiplex, in Nyasaland, **1485**

review of, **547**

Components, for airborne electronic equipment, reliability of, **1939**

and materials, for reliable equipment, **2261**

microstrip, manufacture of, **823**, **1269**

new, on French market, **2529**

nonlinear, in h.f. and l.f. technology, **645**

tests under tropical conditions, **1713**

Computers, (See also Correlators)

analogue, for arc tan ω, **3642**

continuously variable voltage source for, **1056**

for correlation functions, **161**, **453**, **3047**

differential analysers, C.S.I.R.O., **1049**, universal unit for, **146**

diode-bridge limiter for, **2367**

effect of regenerative loops in, **3647**

electronic, 5-channel, **2366**

electronic function generator for, **451**

elements of, **3043**

for Fourier analysis of seismic transients, **2719**

for geophysical data, **2718**

high-speed, for product integrals, **2058**

for hydraulic remote-position-control servomechanism, **1054**

linear-to-logarithmic voltage converter for, **3042**

for magnetic electron lenses, **2722**

for mechanical systems, diode limiters in, **448**

for mine ventilation networks, **3349**

MONECA, for motor-performance calculations, **765**

multiplier circuit for, high-accuracy, **151**, using modulated pulses, **1417**

photoformer design and performance, **452**

for radiation pattern of aerial array, **3198**

Computers, analogue, relative merits of a.c. and d.c. as signal source in, **2717**

resistor-network, **2059**, for biharmonic functions, **1727**, for waveguide and cavity-resonator problems, **(A)150**

for servomechanism design, **1055**

for solving algebraic equations, **3044**

for solving differential equations, use of extrapolation techniques with, **1416**

for solving nonlinear differential equations, **2372**

torque-type, **2364**

for use in loudspeaker design, **3050**

analogue and digital, characteristics of basic units for, **2363**

interconversion of data for measurement and control systems, **2365**

digital, automatic programme planning for, **147**

built on sub-unit principle, '401' model, **2368**

chess-playing, basic features of programme for, **3046**

C.S.I.R.O. Mark I, **1050**, magnetic-drum auxiliary storage system for, **3646**

DINA, for Laplace, Poisson, diffusion and wave equations, **3045**

EDVAC, **2060**, input-output system of, **2371**

electronic, logical symbols for circuit elements of, **1052**, physical realization of, **447**

ERA 1101, design features of, **1414**

Ferranti, photocell input-tape reader for, **1418**

ferroelectric materials as storage elements for, **1053**, **3049**

'floating address' system for, **1722**

Göttingen G1 and G2 models, **1723**

information transfer from punched cards to binary system, **3644**

magnetic-disk pulse-storage device for, **494**

magnetic recording heads for, design of, **768**

magnetic storage devices for, **3351**, magnetic-shift register, **3352**, multistable, **449**, rapid-access, **1724**

at Manchester University, multiplication process in, **1051**

micro-programming and design of control circuits in, **2716**

number-display unit for, high-speed, **2370**

Numerograph recorder for, **1726**

optical encoder and digit register for, transistor-type, **766**, **2373**

parallel, gating method for, **2374**

plug-in etched-circuit units for, **2263**

programme for 'learning' by, **1415**

programme-controlled, present development in Germany, **1725**

regenerative amplifier for, **769**

serial adders for a variable radix of notation, **3645**

storage systems in, bibliography on, **3648**, c.r.-tube, Scotch-plaid raster for, **3649**, matrix-type, **1728**

transistor shift register and serial adder for, **767**

transistor units for, **1729**

use in control systems, **3075**

use of ferrites in, **2061**

use of Ge photodiodes for reading tape input in, **454**

use of single-core magnetic amplifiers in, **3048**

Whirlwind I, **446**

digital-to-analogue converter for, **148**, **450**

integrator for products, **149**

multiplier for, time-division, stabilized, **3643**

punched-card-controlled, for aircraft navigation, **2674**

statistical tabulator for l.v. randomly varying quantities, **2369**

Conduction, electronic, in crystals, sign of e/m for, **1301**

mean free path of electrons in Bi, **996**

in metals with positive Hall effects, e/m ratio for carriers in, **700**, **1300**

Conductivity, electrical, of MgO single crystals, measurements of, **2327**

ionic, in solids, pre-exponential factors in formulae for, **3578**

of ionized gases, **2291**

of water, ethyl alcohol and soil, at λ 8·6 mm, measurement of, **3655**

Conductors, of arbitrary cross-section, h.f. resistance of, calculation of, **3188**

galvanomagnetic effects in, review of, **1974**

round, a.c. resistance and reactance of, **1918**

Conferences and conventions, application of radar in meteorology, Montreal, September 1952, **1361**; applications of communication theory, London, September 1952, **1480**, **2432**, **3601**, **3702**; cathode electronics, Kiev 1951, **892**; C.C.I.F., 16th plenary assembly of, Florence 1951, **533**, **1120**; C.C.I.R., Stockholm 1952, European broadcasting, **211**, **534**, **1799**, u.s.w., **1488**; electrical engineering measurement technique, Delft, May 1952, **154**; Electrical Engineering U.D.C. committee, Copenhagen 1952, **2191**; electron microscopy, Bristol, September 1952, **1771**, Tübingen 1952, **190**; electron optics symposium, London, May 1953, **3681**; electronic instruments symposium, September 1952, **1217**; h.f. electrical measurements, Washington, January 1953, **3651**; I.E.E., British contribution to television, 1952, **243**, symposium on insulating materials, March 1953, **2351**; information theory, London 1950, full report, **2134**; international electroacoustics congress, June 1953, in Netherlands, **2855**; I.R.E., Australia, 1952, **598**, National Convention, New York, March 1953, **1873**; magnetism, Washington, September 1952, **2292**; microwave physics, Oxford, July 1952, **985**; powder metallurgy, Austria, June 1952, **1412**; radio, international, 1946–1951, frequency-spectrum work of, **1124**; radio noise symposium, **693**; semiconductors, Kiev 1950, papers at, **419**; U.E.R., magnetic sound recording, Hamburg, November 1952, **1577**; U.R.S.I., 10th general assembly of, Sydney 1952, **2521**, **2522**

Connectors, plug and socket, multiconductor, printed, **2239**

Contact potential, calculation of, **2286**, **2287**

measurement of, comparison of methods for, **993**

variable-capacitor method for, **3259**

of semiconductors, experimental investigation of, **1696**

——**resistance,** of two granular metal films, **3258**

Contacts, initiation of discharges at, **3579**

metal, at low voltages, in adverse environments, **3496**

noise in due to passage of d.c., **3498**

Pt, effect of circuit inductance on fine transfer between, **3495**

for vibratory converters, long-life, **3497**

Control, (See also Electronic applications; Frequency control; Servomechanisms; Telecontrol)

electronic, of glass-grinding machines, **3379**

of high-power industrial equipment, using magnetic amplifiers, **176**

——**systems,** automatic, design criteria for, **2450**

design of, **1760**

feedback, compensation of, **1135**

nonlinear, stabilization of, **1761**

synthesis of, **3720**

sampled-data, analysis of, **(A)1801**

comparison of sampling with a.m. for, **3722**

with time delay, theory of, **2087**

Converters, (See also Frequency converters; Image converters)

d.c./a.c., gas-tube, for low direct voltages, **2456**

induction galvanometer, **3666**

utilizing valve space-charge capacitance, **1600**

vibrating-capacitor, and application to contact-potential measurement, **475**

negative-impedance, using transistors, **2582**

Cores, with air gaps, alternating-field losses in, **1721**

ferrite, high-μ, complex permeability of, **1705**, measurements on, **1032**

ferroxcube, rod and tube, losses in, **3636**

gapless, for magnetic amplifiers, production testing of, **471**

powder, for military communication equipment, **436**

toroidal, with one or two air gaps, magnetization of, **2584**

Correlation methods, for detection of weak signals, **2124**

determination of output spectra of detectors by, **3699**

Correlators, analogue, 5-channel, **2720**

filtering of clipped signal plus noise in, **532**

for microwave signals, **1067**

thermistor-bridge, **3350**

Cosmic radiation, r.f., (See also Astronomy, radio; Solar radiation)

from galactic hydrogen, at 1·42 kMc/s, **96**, **718**

from galaxy, and cosmic rays, possible relation between, **97**

effect of H II regions on, **3278**

origin of, **1331**

use for investigation of ionospheric irregularities, **722**

positions of six discrete sources of, **717**

from stars, at 81·5 Mc/s, ionospheric refraction of, **407**

from supernova (A.D.1572), at 158·5 Mc/s, **95**

Counter tubes, (See also Valves)

cold-cathode, decade, Type-6167, **1867**

gas-filled, principles and operation of, **3763**

rotating-beam, decade, **2515**

Counters, with Ar and methylene-halide filling, **1461**

binary, reversible, transistor, **650**, **2243**

coincidence, using Type-6BN6 gated-beam valves, **512**

G-M, Ar- or (Ar-CO_2)-filled, discharge mechanism in, **1462**

(Ar-Br)-filled, properties of, **1463**

battery-operated, **3682**

effect of dead time of, **1464**

end effects in, **2411**

with external cathode, application of Wilkinson's theory to, **3389**, C_2H_4 and C_2H_6O as quenching agents in, **2105**, with pure methyl-alcohol filling, **3067**

limitation of discharge in, **3390**, circuit for, **73**

l.v., gas-filled, **3085**

production range of, **797**

self-quenching, with external cathode, characteristics of, **3089**, with external cathode, photosensitivity of, **3088**, factors affecting life of, **2104**, functioning of, **3086**

space-charge sheath in, **798**

for X-ray interference measurements, **799**

Maze-type, with external cathode, construction of, and characteristics in range 0°–50°C, **2106**

pulse, bibliography on, **649**

scale-of-ten, using 4 double triodes, **2242**

scale-of-two circuits, coupling of, **950**

scintillation, discrimination against noise in, **191**

resolution of, improvement of, **2107**

self-quenching, parallel-plate, vapour-filled, **796**

ternary, high-speed, **50**

Couplers, aerial, Π-network, design of, **(D)2588**

bidirectional, resistive T networks as, **2592**

directional, for s.w. reflection measurements, **477**

Transvar, **2931**

wide-band, for power-line carrier equipment, **359**

Coupling coefficient, of i.f. transformers, measurement of, **3658**

of toroidal coils, simple method of, **3554**

Crystals, (See also Piezoelectric crystals; Quartz crystals)

CdS, single, method of growing, **135**

electronic states under strong applied fields, **736**

single, ZnO with excess Zn, optical and electrical properties of, **3628**

synthetic, recent applications of, **1046**

Current, distribution in cylinders, **1650**

electric and diffusion, relation between, application to E-layer displacements, **385**

D

Demodulation, magnetic, **3400**

Detection, linear, of a.m. signals, **208**

of randomly modulated carrier, for pulsed radar, statistical theory of, **3602**

synchronous, of a.m. signals, **528**

of weak signals, by correlation methods, **2124**

Detectors, crystal, Si, **2190**

Si and Ge, conductivity of and flicker effect in, **2189**, flicker effect in, **1047**

diode, efficiency and damping of, **1195**, **2129**

ionized gas, for microwaves, **530**

linear and square-law, correlation method of determining output spectra of, **3699**

linear, square-law, and 3/2-power-law, signal/noise characteristics of, **529**

Dictionaries, radio, English-French, A–C, **597**

Dielectric constant, of absorptive liquids at cm λ, interferometer measurement of, **461**

coaxial-line measurement equipment for range 100–300 Mc/s, **481**

and complex permeability, measurement of at u.h.f., **2381**, optical method for, **995**

of fluids, measurement at cm λ using coaxial-cylinder method, **1734**

of gases, at cm λ, **1063**

of heterogeneous mixtures, theory of, **1693**

of ice, anisotropy of, **2027**

of Rochelle salt, at 3 kMc/s, cavity-resonator method of measurement of, **2729**

of solids and liquids, measurement of, at cm λ, **2067**, results at 9·5 kMc/s, **2068**, using waveguide methods, theory of, **2069**

of uniaxal crystals, measurement by cavity-resonator method, **2382**

of water, ethyl alcohol and soil, at λ 8·6 mm, measurement of, **3655**

of water films and composite mica/water blocks, **1040**

of water in wet clay, **99**

——**loss** angle, bridge method for measurement of, **781**

in solid insulating materials, representation of, **2354**

——**properties,** (See also Insulating materials)

of dipolar materials, frequency dependence of, **1647**

measurement of, by bridge methods, at 80 c/s–40 Mc/s, **3057**

of polar liquids at u.h.f., [illegible]

of polyethylene terephthalate (mylar), **440**

of poor insulators, double-resonant-circuit method of measuring, **3330**

of solids, u.h.f. measurement of, **3656**

theories of, **1692**

of water and of human blood, at u.h.f., **139**

of zirconates, stannates and titanates of bivalent metals, **433**

Dielectrics. See Insulating materials.

——, **artificial,** including arrays of conducting elements, properties of, **2962**

made of conductive particles embedded in wax, **2326**

isotropic, theory and properties of, **(D)113**

for microwave lenses, refractive index of, **3652**

variational methods for, **2325**

Diffraction, (See also Wave propagation, e.m.)

acoustic, by aperture in plane screen, **1881**

by circular apertures, **1557**

by small circular aperture, **3170**

of cm waves, application of Kirchhoff's theory to calculation of, **1296**

by circular aperture, of diameter < λ, **1666**, of diameter > λ, **1667**

by metal cylinder, theory of, **1665**

by diaphragms with slits, in rectangular waveguides, **1583**

by diaphragms in waveguides, **625**

of e.m. or acoustic pulse, by 90° wedge, **986**

of e.m. waves, by aperture in conducting screen, **1293**

by apertures in plane conducting screens, **710**

by circular aperture, **1294**

by conducting circular disk and by circular aperture in conducting plane screen, **3270**

double-approximation method of analysis of, **1295**

by an edge and by a corner, **711**

by half-plane, **88**

by slit, **3269**, exact solution for, **1971**

by thick semi-infinite perfectly conducting plate, **2295**

three-dimensional problem of, **1972**

of e.m. waves from dipole, by half-plane, **2296**

grating, microwave, experiment with, **1246**

plane, e.m. properties of, **3588**

of plane e.m. waves, by circular aperture, **2625**

of plane sound wave, by paraboloid of revolution, **3169**

rigorous theory of, uniqueness of solutions in, **373**

simplifying technique in solution of problems of, **374**

of sound pulse, by nonrigid semi-infinite plane screen, **602**

by oscillatory long strip, **601**

theory of, inconsistency in, **696**

of v.h.f. waves by hills, **3091**

Direction finders, c.r.o. and goniometer types, comparison of, **1367**

polarization errors of, classification of, **(D)2008**

——**finding,** effect of buried cables on accuracy of, **2997**

and ionospheric anisotropy, **2318**

m.f., in aircraft, origin of errors in, **414**

Discharge, (See also Breakdown)

between coaxial cylindrical electrodes in transverse magnetic field, **1655**

corona, suppression methods for, **1306**

currents, self-maintained, control by cathode illumination, **3264**

gas, British Association discussion on, **701**

effect of superposed r.f. field on, **3263**

at electrical contacts, initiation of, **3579**

Discharge, gas, h.f., characteristics and mechanism of, **1961**, electrodeless, in magnetic field, resonance in, **85**, measurement of admittance and electron density of, **463**, between plane plates, low running potential of, **703**

low-pressure, reliability of probe measurements in, **381**

microwave determination of electron density in, **380**

shot noise in, **2185**

at single electrode, at 31·7 Mc/s, **1307**

Hg-vapour, absorption and reflection of microwaves by, **1656**

microwave admittance of, **1654**

in magnetic fields, investigations of, **1653**

mechanism of, **1652**

spark, in N_2, time lag of field breakdown in, **1308**

between positive point and plane in compressed air, **3265**

in transverse magnetic field, theory of, **84**

——**tubes,** (See also Valves)

cold-cathode, switching applications of, **288**

Type-2313, for switching systems, **538**

corona, for voltage stabilization, **1136**, **(D)2803**

glow, voltage-regulator, characteristics of, **(D)267**

hot-cathode, oscillatory phenomena in, **2959**, **2960**

Discriminators, frequency, for f.m. reception and a.f.c., **684**

using quartz-crystal circuit, **1277**

u.h.f., frequency-stabilized, **2386**

Distance measurement, by echoes, optimum signal characteristics for, **411**

Distortion, amplitude and phase, effect on limited-spectrum signals, **1177**

in video amplifiers, relations between, **980**

in anode-modulated transmitters, **262**

in class-A push-pull amplifiers, **2610**

due to curvature of valve characteristics, **1854**

'difference-diagram' method of diagnosis of, **2383**

in f.m. reflex klystrons, **1545**

of f.m. signals in tuned interstages, evaluation of, **3550**

in f.m. systems, calculation of, **2141**

due to perfect reactance valve, **3104**

due to small loss and phase variations, **1484**

in frequency-division multiplex systems, reduction of, **2788**

group-delay, in transmission system, measurement of, **1076**

harmonic, in f.m. or ph.m., **1282**

meter for, theory and construction of, **1078**

in negative-feedback amplifiers, **2278**, **(D)3253**, **(D)3568**

intermodulation, in multichannel radio systems, **1796**

significance and measurement of, **1737**

measurement, double-tone and intermodulation methods of, comparison of, **163**

meter, rectifier-type, direct-reading, 0·5–30 %, **167**

modulation, in television reception, **260**

due to multipath transmission, in f.m. u.s.w. R/T beam link, **218**

nonlinear, in broadcasting-studio a.f. equipment, measurement of, **2735**

comparison of measurement methods, **2734**

in gramophone reproduction, measurement of, **2736**

intermodulation methods of measurement of, **2737**, rigorous basis of, **3059**

of progressive sound waves, **1553**

in transmission of musical intervals, perception of, **304**

in teleprinter signals, definition and c.r.o. measurement of, **3408**

E

Earth, rate of rotation of, changes of since 1820, **1332**

Electrets, **74**

mathematical theory of, **3257**

plastic, experimental investigation of, **2025**, **3323**

Electric field, above and below infinite corrugated sheet, **2965**

2-dimensional, correlative property of, **3573**

Electrical quantities, sinusoidally varying, vector representation of, **1919**

Electrodynamics, nonlinear, theory of, **1969**

unified gravitational field theory of, modification of, **1291**

Electroluminescence, explanation in terms of glow discharge, **1644**

refutation of, **3255**

field strength and temperature of $ZnS_{0\cdot4}Se_{0\cdot6}$:Cu powders in thermoplastic matrix, **3575**, **3576**

initial rise of brightness under action of alternating field, **2282**

measurements on lamps and studies of phosphors, **2956**

new light source, **3256**

of ZnS-Cu phosphor, **2283**

Electrolyte tank, accurate mapping of e.s. fields in, **2739**

Electromagnetic field, in conducting medium, of electric dipole, **2109**

of magnetic dipole, **39**, **2413**, **3202**

impulse, **38**, **(D)1591**

in plane of circular aperture, for incident spherical waves, **1667**

of rotating uniformly magnetized sphere, **1334**

——**theory,** circulation in flow of electricity, and Dirac's new variables, **1645**

current distribution in disk rotating in magnetic field, **1313**

general relativistic equations for material medium, **1956**

Maxwell's equations, general solutions of, **2294**

Poisson-Kelvin hypothesis and theory of dielectrics, **994**

simplified form of relativistic e.m. equations, **707**

Electrometers, logarithmic scale 10 V–1 kV, **3364**

Electron beam, entering axial magnetic field, characteristics of, **2638**

deflection systems for, and their aberrations, **2842**

focused, electron-charge spreading of, **2962**

focusing of, optimum space-charge-controlled, **901**

  - in rotating magnetic fields, nonoptical theory of, **3580**
- high-energy, radiation from, **3582**
- low-noise, **1183**

Electron beam, magnetic-field focusing of, **175**
- modulated, measurement equipment for, **263**
- reflected, space-charge spread of, **2961**
- space-charge-wave propagation in, **268**, **3450**
  - influence of Lorentz force on, **2182**
- in static e.m. fields, imaging properties of, **1657**
- velocity distribution in, change of, **2493**

——emission, (See also Cathodes; Photoelectric emission)
- field-type, from CdS and CdSe, **1391**
  - from surface films, **3267**
  - and work function, of crystal surfaces, **1963**
- secondary, from Ag and Cu films for primary-electron energies < 10 eV, **1658**
  - from BaO, **895**
  - from cold-worked metals, **1390**
  - determination of origin of electrons, **2336**
  - from dielectrics under single-pulse conditions, **3008**
  - field-dependent, mechanism of, **998**
  - measurement of, errors in, **3581**
  - from metals, after irradiation, **3266**, due to Li$^+$ ions, **384**, **2631**
  - from Ni, angular distribution of, **584**
  - theory of, **705**
- thermionic, correction to Schottky's equation, **1861**
  - energy distribution of electrons in, **2963**
  - flicker effect in, temperature dependence of, **3150**
  - pulsed, electron-velocity distribution in, **2837**
  - from various materials, survey of, **2832**
  - work function of, graphs for calculation of, **3583**
- thermionic and secondary, from BaO during electron bombardment, **2184**
- thermionic constants, of metals of the first transition group, **1392**
  - of monovalent metals, **2700**
- from valve grids, and its elimination, **899**

——gas, magnetic properties of, and number theory, **991**, **992**

——guns, single-velocity, noise analysis of, **1848**

——lenses, astigmatism of, **2097**
- e.m., sector-shaped, angular aberrations in, **3680**
- e.s., aperture, focal properties and spherical-aberration constants of, **188**
  - cylindrical, with three slits, field of, **2094**
  - determination of electron trajectory by successive differentiations, **2096**
  - electron-optical properties of, **795**
  - for focusing high-energy particles, **2409**
  - for focusing very-high-energy particles, **1769**
  - immersion objective, low-voltage, experimental investigation of, **2410**, with plane electrodes, **1458**, **1770**, resolving power of, **186**, **187**
  - paraxial trajectories in, **510**
  - potential distribution in, **3383**
  - single, permitting rigorous calculation, **2095**
  - spherical aberration of, calculation of, **1100**, measurement of, **1459**
  - with thick electrodes, axial potential distribution of, **1102**
- grid-type, spherical aberration of, **1101**
- magnetic, asymmetry of, **2098**
  - axial field of, approximate formula for, **2099**, electrodynamic measurement of, **1743**, measurement of derivatives of, [illegible]
  - with axial field γ/z^n, **189**
  - effect of pole-piece saturation in, **3386**
  - remanence in soft-iron circuits of, **2102**
- and quadripole networks, analogy between, **2760**
- with radially decreasing magnetic field and cylindrical electric field, focusing properties of, **1460**

——microscopes, device for selecting specimen detail for observation, **3080**
- direct measurement of images in, **2759**
- emission-type, image aberrations due to cathode irregularities of, **3081**
  - surface images obtained with electrons due to bombardment by ions, **2757**, **3388**
- e.s., with intermediate accelerator, h.f. h.v. equipment for, **2103**
  - for laboratory, construction details of, **2101**
- magnetic circuit in lenses for, **3385**
- R.C.A. Type E.M.U., objective-aperture centering and interchanging device for, **2758**
- reflection-type, **1457**
- scanning-type, **1768**
  - improved, for opaque specimens, **3382**
- small, design of, **2756**

——microscopy, field-emitter fabrication and application, **3082**

——motion, in Coulomb electric and uniform magnetic fields, **1648**
- in electric and magnetic field, analysis of, **76**
- in field of uniformly wound toroid, **383**

——multipliers, (See also Photocells)
- with BeCu plates, activation of, **1517**
- development of, **3139**
- theory of and experiments on, **289**

——optics, double focusing of charged particles with wedge-shaped magnetic field, **1456**
- ideally focused systems, space-charge requirements in, **3384**
- spherically corrected systems, adjustment of, **2100**
- third-order aberrations of centred systems, calculation of, **3083**

——trajectories, automatic tracer for, **476**
- calculations of, **511**
- determination by successive integrations, **1767**
- in e.m. and e.s. fields, calculation of, **77**
- rubber-membrane model for study of, **3756**

Electron **tubes**, (See also individual types)
- for industry and research, classification of, **587**

Electron-ion streams, propagation in, **1316**

Electronic applications, (See also Control; Heating; Photocells, applications of)
- acoustic firing-error indicator, **192**; aircraft-vibration research, **491**; cable-diameter measurement, **791**; camera-shutter testing, **2750**; contour recording and reproduction using magnetic tape, **1449**; control of soldering machines, **193**; electronic balance, rapid, **3685**; food sterilization by h.v. electron beam, **505**; industrial uses of 'Magamps', **945**, **1095**; inspection of wire ropes while in service, **503**; magnetic method for testing winding ropes, **3378**; measurement of pH, **3683**; measurement of spray particles, **3684**; measurement of velocity of explosion-wave fronts, **2086**; nonquantized f.m. altimeter, **3311**; prevention of drill breakage, **2088**; resistance-welding control, **502**; speed-sensing relay, **499**; tachometer, **2747**; in textile industry, **177**, **504**; viscometer with servomechanism, **3673**

Electronic engineering, sources of information on, **2192**

Electrons, atomic mass of, and Rydberg constant, **697**
- charge on, determination from shot-noise measurements, **1959**
- deflection by charged filament, **1299**
- Dirac's equation of, application of Schwinger's variational principle to, **2626**
- Dirac's new theory of, angular momentum in, **1297**
  - discussion of, **990**
  - energy momentum tensor in, **1298**
- fast, charge on, measurement of, **2957**, **2958**
- kinetic energy of, influence of magnetic impulses on, **2300**
- mobility in strong e.s. fields, **1302**
- photo- and exo-, use for surface investigations, **2301**
- velocity distribution after passage through matter, **704**

Energy flow, calculation by means of Laplace transform, **955**

Equalizers, attenuation, performance of, **2594**
- variable, for broadcast programme circuits on trunk lines, **820**

Exhibitions, A.P.A.E and B.S.R.A., London 1953, a.f. equipment at, **2531**; Audio Fair, 1952, **1218**; British Instrument Industries, July 1953, **3162**; components, Paris 1953, **2262**, **3547**; Paris Fair, 1953, radio and television receivers at, **3398**; Physical Society, 1953, **2523**, **2524**; R.E.C.M.F., April 1953, **1618**, **2524**; S.B.A.C., Farnborough 1952, **226**, **1216**; Scientific Instrument Manufacturers' Association, London 1952, **1547**; Technical Fair, Hanover 1952, **166**, **178**, **299**; Television Society, December 1951, **232**; 2nd Television Salon, Paris, October 1952 **845**; 6th R.S.G.B. amateur-radio, **1215**; 19th National Radio, London 1952, **300**, **301**; 20th National Radio, London 1953, **3163**, **3765**

Experimental curves, successive differentiation of, and method of smoothing, **2619**

——results, representation by equations, **370**, **371**

F

Facsimile, high-speed system, direct-scanning, **(A)841**, **3730**
  - Philips, **2460**
- improvements in Italian equipment for, **1492**
- new equipment for, **557**
- review of development of, **558**
- transmitter-receiver using subcarrier f.m., **559**
- weather-map transmissions from Washington, Port Lyautey, Balboa and Frankfort, **1138**

Faraday effect, in conductors and semiconductors, **2299**
- in ferrites at u.h.f., and microwave gyrator, **2922**
- for guided microwaves, **(C)1232**, **2389**
  - measurement of, **2890**
- for microwaves, in nonsaturated ferromagnetic materials, **1709**

Feedback, (See also individual equipment)
- frequency-dependent, **3549**
- systems, conditionally stable, design of, **2453**

Ferroelectric materials, BaTiO$_3$, dielectric properties in stationary fields, **3011**
  - domain properties of, **759**
  - effect of polarizing field on properties of, **112**
- BaTiO$_3$ ceramics, effect of composition on properties, **3010**
  - h.f. hysteresis loops of, **3012**, **3013**
  - with maintained bias voltage, electromechanical response and dielectric loss of, **3168**
- BaTiO$_3$ and BaTiO$_3$-PbTiO$_3$ ceramic, measurements on, **1694**
- BaTiO$_3$ single crystals, dielectric properties of, **3009**
  - statistical model of, **1043**
- Cd and Pb niobates, crystal structure of, **1374**, **2324**
- ceramics, variation with time of dielectric constant, **2026**
- KH$_2$PO$_4$, properties below Curie point of, **2047**
  - X-ray analysis of transition in, **2048**
- PbTiO$_3$ single crystals, dielectric properties of, **1410**
- properties and applications of, **1373**
- for radio applications, properties of, **3635**
- Rochelle salt, effect of electric field on domain structure of, **2050**
- as storage elements for digital computers, **1053**, **3049**
- very small particles, anomalies near Curie point, **3007**

Ferromagnetic materials, alloys, Al-Si-Fe, magnetoresistance of, **125**
  - alcomax III, preferred direction in, **2342**
  - alnico-5, magnetostriction in, **2344**
  - Co-Ni, Hall effect in, **3625**
  - Fe-Ni, magnetostriction in, **2345**

Ferromagnetic materials, alloys, Fe-Ni-Mo, vibralloy, **124**
  - Gd-Mg, properties of, **127**
  - high-strength, origin of damping in, **3622**
  - Mn-Bi, preparation and permanent-magnet properties of, **1035**
  - Ni-Mn, properties of, **3025**
  - permalloy, noise of, space correlation of, **3029**
  - permanent-magnet, Co-Pt, properties of, **(D)2709**
  - perminvar, magnetization characteristics of wire under tension, **2703**
  - Si-Fe, anisotropy of coercive force in, **2704**, grain-oriented, **3030**
  - Si-Fe sheet, field effect on hysteresis loop of, **126**
  - ultrathin tapes for h.f. cores, **760**
- α-Fe and Fe alloys, structure of, **3027**
- armco iron, Hall effect in, **3625**
- BaFe$_{12}$O$_{19}$, sintered, preferred crystal orientation in, **1036**
- BaFe$_{16}$O$_{27}$, crystal structure of, **754**
    - with high crystal anisotropy, **752**
- Co compounds with perovskite structure, **2701**
- coercive force of, effect of small ellipsoidal inclosures on, **3026**
- with complex conductivity, eddy-current losses in, **1400**
- for cores, properties of, **3635**
  - of small transformers, improvements in, **761**
- dilute iron-powder mixtures, approach to saturation in, **2337**
- domains in, investigations of, **749**
- effect of current or stress on magnetization characteristic of, **1704**
- effective atomic distances in, **1393**
- Fe, high-purity, effect of dissolved O on properties of, **1034**
- Fe and Ni, temperature variation of Hall effect in, **1706**
- Fe single crystals, temperature dependence of magnetoresistance of, **2044**
- ferrites, Co, variation of magnetostriction with composition, **131**, variation of magnetostriction with temperature, **132**
  - Co and Ni, magnetostriction of, **1399**
  - coaxial-line measurement of constants of, **1742**
  - double refraction of microwaves by, **755**
  - ferroxcube, properties of, measurement of, **3060**, properties and applications of various grades of, **750**, **1395**, **(C)2042**, **(C)2702**
  - magnetic quality factor μQ as criterion for, **1707**
  - Mg, neutron diffraction study of, **3335**
  - Ni, Hall effect in, **1398**
  - Ni-Zn, magnetic viscosity of, **3621**
  - parameters of magnetostrictive vibrations in, **3624**
  - permittivity and permeability of 6·6-cm λ, **(C)1401**
  - possible applications of, survey of, **1396**
  - sintered, developments in, **3334**
  - specific heat discontinuity in, **3623**
  - spontaneous magnetization of, **1397**
  - structure and properties of, review of, **2043**
  - temperature dependence of magnetic spectrum at v.h.f., **1312**
  - in waveguides, properties and applications of, **931**
- errites and iron powders, r.f. measurements on, N.B.S. methods, **2074**
- erroxdure, properties of, **751**
- haematite, crystal structure and antiferromagnetism in, **1311**
  - thermomagnetic properties of, **2705**
- influence of grain size on coercive force, **2341**
- influence of magnetic field on polymorphic transformation in, **2339**
- magnetic after-effects in, **2041**
- magnetic viscosity under discontinuous and continuous field variations, **123**
- metals, effect of spontaneous magnetization on resistance of, **1402**
  - thermal and thermoelectric properties of, **1394**
- microwave Faraday rotation in nonsaturated condition, **1709**
- Ni, and alloys, in valve manufacture, **3629**
  - magnetostriction and Δ-E effect in, **1038**
  - temperature variation of magnetization of, **1033**
- Ni-Cr steels, effect of fatigue on magnetic properties of, **1037**
- nonuniformly magnetized, determination of coercive force of, **3024**
- particles, motion in field of electromagnet, **1663**
  - motion in rotating magnetic field, **1664**
- powders, Fe and Cu-Ni-Fe-alloy, production and application of, **762**
  - iron-oxide, magnetic properties of, **2338**
  - permalloy and iron, gyromagnetic effect in, **757**
- with rectangular hysteresis loop, performance under current-pulse conditions, **128**
- relation between hysteresis coefficient and permeability of, **756**
- temperature-sensitive, survey and applications of, **3338**

Ferromagnetism, collective electron theory of, **1968**
  - and overlapping energy bands, **1662**
- Ising model of, theory of, **2964**
- quantum theory of, **2340**
- theory of, **3586**
  - and electron-spin degeneracy, **1001**
  - and Heisenberg's model, **1003**
  - Zener's, **1002**

Field strength, (See also Reception; Television; Wave propagation, e.m.)
- near antipode of transmitting station, calculation of, **2779**
- 'fixed-level' recording method for, **2065**
- v.h.f., influence of ground on measurement of, **2389**
- over irregular terrain, in u.h.f. 300–900-Mc/s television band, **1786**
- for long transmission paths, calculation of, **2778**
- low-level, signal-generator method for measurement of, **1061**
- meters, commercial, N.B.S. calibration of, **773**
  - 500–700 Mc/s, **156**
- at Riverhead, N.Y., of station KC2XAK, at 534·75 Mc/s, **1113**
- sky-wave, h.f., graphical calculation of, **199**, **2777**

Field strength, of Swiss broadcasting stations, **2424**
- of television transmissions, measurements by helicopter, **576**
- at 93 Mc/s, for paths of 40–150 miles, analysis of, **809**

Films, (See also Sound recording; Television)
- thin, CdO, sputtered, conductivity and structure of, **133**
  - conducting, on glass, N.P.L. method for, **3340**, PbS and Te, capacitance effects in, **2882**
  - dielectric, on Al, conductivity distribution within, **3523**
  - evaporated, Ag and Ge, contamination by heater material, **758**, Au, preparation and properties of, **430**, Cu and Ag, mean free paths of conduction electrons in, **714**
  - Fe, effect of magnetic field on resistance of, **1039**
  - Ge, production by evaporation from carbon crucible, **3032**
  - metal, deviations from Ohm's law in resistance of, **2685**, evaporated, electrical conductivity of, **3031**, in longitudinal magnetic field, conductivity of, **3626**, resistance variation with applied potential, **3339**
  - Mo, with SiO coating, time variation of resistivity of, **429**
  - Ni, sorption properties of, **3271**
  - of oxide on Al, ionic current and growth of, **2347**
  - Pt, covered with dielectric layer, resistance of, **134**, resistance variation with applied direct voltage, **3577**
  - Te, effect of electric field on conductance of, **1695**
  - uniform, evaporation technique for, **428**

Filters, (See also Networks)
- acoustic, multilayer, **912**
- a.f., using negative feedback, **3545**
  - resonant, high-Q, **351**
- analysis and design of, graphical methods for, **(D)349**
- band-pass, cm-λ, using coupled cavity resonators, bandwidth of, **1935**
  - multistage, with nearly rectangular response curve, **1613**
  - using quartz-crystal resonators, design of, **3552**
  - u.h.f., using waveguides and coaxial-line resonators, **1933**
  - wide-band, two-stage, graphical calculation of transmission range of, **57**
  - Zobel and Laurent, unitary design system for, **3236**
  - 8–13-c/s, **3237**
- bridge-type, symmetrical, design by use of operating-parameter theory, **3235**
- coaxial-line, band-pass and high-pass, **669**
- constant-k, termination variation in, **3233**
- coupling-free, systematic design procedure for, **1612**
- design of, Wagner's methods for, **1931**
- electromechanical, i.f., **1615**
- electronic, variable-bandwidth, synthesis of, **2925**
- with generalized parameters, calculation of, **(C)56**
- ladder, attenuation chart for various types of, **(A)961**, **3544**
  - design of, **1932**
  - effects of terminations on insertion loss of, **2596**
  - low-pass, formulae for, **666**
- lattice, antimetrical, theory of, **2597**
- low-pass, linear-phase, design of, **1614**
  - Tchebycheff-type, formulae for, **962**
- with minimum number of inductors or capacitors, design of, **2595**
- with minimum number of resonators and minimum no-load Q, **3543**
- multiple-resonant-circuit, alignment of, **(C)1268**
- *n*-mesh, *RC*, admittance and transfer functions of, **1934**
- nonlinear, for detection of sine-wave signals in noise, **206**
  - optimum, **2598**
- optimum, for detection of signals in noise, **205**
  - linear, Wiener's theory of, simplified presentation of, **2260**
  - new procedure for design of, **2924**
- r.f. and i.f., transient response of, **(A)350**, **963**
- semifinite-terminated, design of, **2923**
- statistical, nonlinear, **667**
- and switches, u.h.f., for London/Birmingham television relay link, **951**
- Tchebycheff-type, numerical calculation of, **668**
- theory and technique of, fundamentals of, **665**
- transfer function of, synthesis of, **1611**
- and transmission lines, transient response of, formulae for, **1248**
- waveguide, direct-coupled, narrow-band, synthesis of, **58**, **(D)3234**

Fluctuations, (See also Noise)
- electrical, theory of, **2288**
- random, history of investigations of, **908**

Fluoroscopy, electronic intensification of images in, **1098**

Fluxmeters, rotating-coil, **1430**

Frequency, (See also Analysers; Analysis)
- absolute, estimation of in 1950–1951, **(A)153**, **1058**
- allocations, international, for maritime distress signals, **829**
- calibrator, 0·25–250-Mc/s, **1751**
- changers, magnetic-cross, for subharmonic generation, **3502**
  - using Type-DK92 heptode, for 3·3–30 Mc/s, **818**
- control, automatic, theory of, **3214**, **(C)3524**
- converter, for adapting s.w. receiver to 200-kc/s reception, **3698**
- dividers, locked-oscillator, using nonlinear elements, **1281**
  - stable, using thyrite elements, **3560**
- elimination, by transconductance bridge, **59**
- instantaneous, concept of, **2908**
- measurement, accurate, **1069**, a.f., **1738**
  - of f.m. transmission, by pulse counting, **3660**
- meter, automatic, for very low frequencies, **3375**
  - cavity-resonator, for range 22–37 kMc/s, **3668**
  - direct-reading, 30 c/s–30-Mc/s, **171**
  - reed-type, 5–270-c/s, **1079**
- rapidly varying, instantaneous measurement of, **1428**
- rate indicator for mains-frequency control, **1137**

Frequency, stabilization. See Stabilization, frequency.
- standard, (See also Standard-frequency transmissions)
  - N.B.S., improvements in, **1731**
  - 1-Mc/s, derived from WWV signal, **456**
- substandards, microwave, N.B.S., and calibration service, **2063**
  - using transistor oscillator and 100-kc/s quartz crystal, **2064**, **3051**
  - 100-c/s–100-kc/s, portable, **3070**
- synthesis, for range 1 kc/s–100 Mc/s, **2376**

G

Galactic radiation. See Cosmic radiation

Galvanometers, coupled, Brownian fluctuations in, **2077**
- induction, as sensitive d.c./a.c. converter, **3666**
- matching of thermocouples to, **2387**
- moving-coil, extreme-sensitivity, **2076**
- resonance, transformer-coupled, **2388**
- valve, logarithmic-scale, **3363**

Generators, (See also Noise; Oscillators; Signal generators; Sound)
- e.s., rotary, 100-kV, **2459**
  - van de Graaff, 1-MV, for ion accelerator, **184**
- h.v., Cockcroft-Walton voltage-multiplying circuit for, **2151**
  - for c.r.o. and television equipment, **2812**
- impulse, 3-MV, standard-waveform production with, **974**
- surge-wave, repetitive, **1088**

Geomagnetic storms, and aurora, theory of, **1013**
  - 35- and 74-Mc/s pulse echoes during, **2976**
- characteristics of storm of 3rd Aug. 1949, **2644**
- M-type, correlation with monochromatic corona, **2975**
- morphology of, **2645**
- new theory of, **2646**
- polar, constitution of, **2977**, **2978**
- recurrence tendency of, **2974**
- reverse pulse preceding sudden commencement of, distribution of, **2973**
- and sunspots, **2641**
- theory of movement of, **100**
- Jan.–June 1952, **400**, March–Sept. 1952, **1339**, July–Dec. 1952, **1988**, Oct. 1952–March 1953, **3284**

Geomagnetism, correlation with solar activity, **1011**
- disturbances, diurnal and storm-time variations of, and ionosphere, **3300**
  - international data, first quarter 1952, **401**, second quarter 1952,

1340, third quarter 1952, 1989, fourth quarter 1952, 3285
    variation of recurrence interval with solar cycle, 1835
  field for epoch 1942, harmonic analysis of, 3279
  field variations, during bay disturbances, 2972
    diurnal, and electrical conductivity of upper atmosphere, 2647
    eleven-year, analysis of, 1337
    mean, and secular, in Adélie Land, May 1951–Jan. 1952, 2305
    and rate of earth's rotation, 1338, 3281
    secular, at Colaba and Alibag, India, 399, in New Zealand, 3282
    solar-flare type, and integrated conductivity of ionosphere, 2663, 2664, 2665, 2666
    two-dipole model for, 1012
  K-indices, at Abinger, Eskdalemuir and Lerwick, July–Aug. 1952, 396
    at Cheltenham, April–June 1952, 397, July–Sept. 1952, 1336, Oct.–Dec. 1952, 1987, Jan.–March 1953, 3280
  micropulsations, statistical treatment of, 2643
  and sunspots, 2642
Geophysical prospecting, equipment for, 2749
Graphite, artificial, resistivity of, influence of coke-calcining temperature on, 1041
  crystal structure and physical properties of, 1411
  electrical properties of, 2051
Ground, conductivity of, determination from wave attenuation and range data, 3687
Gyrators, (See also Faraday effect)
  acoustic, 1874, 2532
  using Faraday effect in plasma, 1285, 3232
  using Hall effect in Ge, 1930
  microwave, using ferrite-cored waveguide, reduction of loss in. 1610
  three-terminal, 3228

H

Hall effect, a.c., in semiconductors, recording apparatus for, 1057
  in BaO single crystals, 129
  in Fe and Ni, temperature variation of, 1706
  measurement of, geometrical arrangement in, 3054
  and related thermomagnetic and galvanomagnetic effects, 713, (C)2975
  and resistivity, connection between, 1319
  in Ti, 2049
Hearing aids, using transistors, commercially available models, 1903
  audibility of frequency vibrato, influence of nonlinear distortion on, 2870
  masking of tones by noise as function of interaural phase. 9
  and memory for acoustic effects, 306
  perception of a.m. and f.m. of pure tones, 303
  perception of a.m. tones. 1883
  perception of nonlinear distortion in transmission of musical intervals, 304
  process of speech perception, 920
  stereophonic, theory of, 2546
  threshold of, for loudness and pitch variations, 1882
Heating, h.f., dielectric, 1453, correlation of temperature and field strength during, 500
Heating, h.f., induction, bibliography on, 3676, for hardening band-saw teeth, 179, of metals, 1452

I

Image converters, as high-speed shutters in photography, 2751
  for observation of very-high-speed phenomena, 1763
Impedance, (See also Acoustics; Aerials; Networks; Transmission lines)
  acoustic, absolute measurement of, 917
    measurement of, by resonance method, 2545 by transmission-characteristic method, 2868, using water-filled tubes for, 2866
  characteristic, of coaxial cable, frequency-sweep measurement of, (D)3058
    electrical and acoustical, incomplete analogy between, 4
  complex, meter for, 30-c/s–15-kc/s, 2741
  diagrams, geometrical transformation of, 2576, 2907, (C)3494
  matching, frequency-independent transition between coaxial cable and balanced line, 3478
    with λ/4 sections, charts for bandwidth in, 30
    and measurement at v.h.f., 1747
    with modified exponential transmission lines, 3533
    with transmission-line transformer sections, 2249
    u.h.f., termination for waveguides or coaxial lines, 1073
    wide-band, of coaxial cable to waveguide, optimum piston position for, 1260, with directional coupler, 29
  measurement, a.f. to v.h.f., shunted-T circuit for, 1062
    equipment for range 50–500 Mc/s, 478
    on helix of travelling-wave valve, 3753
    microwave, using double-slug transformer, 774, 3-probe method of, 462
    u.h.f., equipment for coaxial cables, 2393
  meters, for crystal units, 2390
  of parallel conductors, proximity-effect formula for, 2918
  Smith-chart plotter, automatic, 3065
Impedors, termination, maximum power in, 1258
Induction, of current in wide conductor by narrow conductor carrying h.f., 81
  of currents in disk by creation of magnetic poles, 708
  magnetic, null method for measuring, 1744
Inductors. See Coils.
Instruments, measurement, error of, 1074
  for microwave measurements, (D)3362
Insulating materials, (See also Ferroelectric materials)
  araldite, properties of, 138
  BaTiO$_3$, transition energy and volume change in, 2063
  brush-discharge ionization in, 136
  ceramics, BaTiO$_3$-BaSnO$_3$-SrTiO$_3$, properties of, 1718
    niobates and tantalates, 137
    titanate, potential distribution in, 439
  glass, tellurite, 143
  glass-fibre paper, properties of, 1719
  glasses, borosilicate, power factor as function of composition of, 443
  IN-420 chlorinated impregnant, properties of, 3633
  laminated plastics, properties of, 2353
  liquid, fluorinated, properties of, (A)3037
  modern, r.f. properties of, 1716
  organic, new polymers and synthetic resins, 3634
  polyvinyl chloride, properties and application of, 1720
  rare-earth titanates with perovskite structure, 1717
  relation between breakdown strength and mobility of charges in, 1375
  relation between high-voltage polarization and intensity of electric field, 2681
  rubber, electrical properties of, 2055
  semiconducting ceramic glazes, properties of, 438
  SF$_6$, r.f. electric strength of, 3627
  silicone resins, for use at power frequencies, 2352
  silicone rubber, properties and applications of, 2054
  theory of, 1372
  TiO$_2$, properties of, 1048
  TiO$_2$ (rutile), effect of impurities on conductivity of, 2683
    physical properties of single crystals, 434
Intercommunication systems, noise reduction in, 2787
Interference, from automatic telephone apparatus, suppression of, 1476
  in broadcasting and television reception, problems of, 1179
  from carrier-current circuits on overhead power lines, reduction of, 1794
  co-channel, ground/air, at 2·9 kMc/s, 1798
  from electric railways, Swiss investigation of, 2131
  evaluation by means of noise filters, 2430
  from fluorescent lamps, suppression of, 2133
  in f.m. and a.m. reception from unwanted transmitters, 531
  from h.v. lines, investigation of, 2631
  from ignition systems, in television, relative sensitivity of vertical and horizontal dipoles to, 1180
  impulse, in television receivers, reduction of, 1843
  in long-wave reception, loop aerial for elimination of, 35
  measurements in aircraft, double-beam c.r.o. for, 2075
  in radiotelegraphy, due to adjacent-channel transmissions, 540
  from television receivers, reduction of, 2476
  in television reception, apparatus for demonstrating various types of, 2274
    from aurora, 1173
    from bus bells, 577
    from f.m. u.s.w. receivers, maximum value of, 867
    and its suppression, 2173
Interferometers, electron-beam, using 3-crystal beam splitter, 3074
  ultrasonic, 1223
Interferometers, ultrasonic, for high fluid pressure, 2542
Ionization, thermal, use of cm waves in study of, 3268
Ionosphere, (See also Absorption; Atmosphere; Recorders; Wave propagation, e.m.)
  abnormalities at high latitudes, 1672
  conditions in, and radio 'weather', 2417
  conductivity of, and 'dynamo' currents in, 1352, 1353
    integrated, and solar-flare type of variation of geomagnetic field, 2663, 2664, 2665, 2666
  currents, in auroral zone, 2648
    and geomagnetic tides, 2312
  D layer, formation of, 2652
    r.f. absorption over Singapore and Slough, 2660
  D and lower-E layers, model deduced from long-wave measurements 2306
  disturbances, forecasting of, 3288
    index for, 3302
    in N. America, maps of, 3296
    during severe geomagnetic storms, characteristics of, 2987
    of 23rd–28th Feb. 1952, 101
  effects of crossed magnetic and alternating electric fields in, 1995
  E layer, definition of critical frequency and measurement of ionization of, 721
    effect of solar eclipse 25th Feb. 1952, 1675, 1994
    h'f curve for, statistical study of minimum frequency in, 2654
    ionization in, determination by V-2 rocket method, 3291
    ionizing effect near sunrise, 1346
    lunar effects on, theory of, 385
    moving clouds of ionization in, 2310
    production in O$_2$-dissociation region, 723
    winds and turbulence in, investigation of, 1676
  E and F$_1$ layers, at high latitudes, solar effect on, 406
  E$_s$ layer, over Calcutta, nature and origin of, 3292
  electron collision frequency in, 3299
  electron density in, and layer heights of, 3598
    vertical distribution of, 409, (D) 1997
  F layer, effect of solar eclipse of 9th May 1948 on, 2658
    transient disturbances in, 404
    triple splitting in, 3295
  F$_{1\cdot5}$ layer at Dakar, and motion of sun, 1347
  F$_1$ and F$_2$ layers, comparative increases of ionization from sunspot minimum to maximum, 1993
  F$_2$ layer, critical frequency, variation with sunspot number, 2657. world distributions of, 2984
    disturbance in, relation to geomagnetic storminess, 2986
    electron density, below maximum-ionization level of, 1349, night variations of, 2656
    over equatorial Africa, effect of solar eclipse 25th Feb. 1952 on, 1327
    frequency-sweep measurements of height of, 3297
    longitude effect in, (D) 2307
    lunar effect on median height of, 405
    mechanism of electron removal from, 3298
    night-time recombination-coefficient and temperature variations of, 2662
    solar tides in, 1348
    storm phenomena in, 2982, 3304, classification according to characteristics and world distribution, 2983, geomorphology of, 1673
    variations accompanying geomagnetic storms, 3303
  frequency of occurrence of *f*E$_s$ and *fmin*F, 2985
  and geomagnetism, diurnal and storm-time variations of, 3300
    variations associated with, morphology of, 3301
  h't measurements at Wakkanai, Japan, during eclipse of 9th May 1948, 2659
  ionization over auroral zone during geomagnetic storms, 2991
  irregularities in, investigation by means of galactic r.f. waves, 722, 1674
    motion of, wave hypothesis of, 2655
  layer heights, calculation of, taking account of geomagnetic field, 3290
    measurements at oblique incidence over Eastern Australia, 807
  long-delay echoes at 150 kc/s, 1992
  low-level echoes, correlation with abnormally high absorption in, 519
  lower, long-duration back scatter of 33-Mc/s pulse signals from, 2000
  phase change of pulse echoes, measurement of, 3599
  properties of, rocket investigations of, 726
  recombination coefficient for, determination of, 2653
  recording stations, world list of, 2668
  research at Kodaikanal observatory, 392
  review for 1952, 1016
  shielding effect of, 2667
  'sluggishness' of, 3289
  sounder, automatic, 3356
    Berkner-Wells-Seaton type, improvements to, 725
    frequency-sweep, 724
    high-precision, 1677
    oblique-incidence, COZI communication-zone indicator, 3600
  storms, in auroral zone, 3293
    and F$_2$-layer geomagnetic anomaly, 2308
    Japanese investigations of, 2988
    warning system, B.B.C., 103, value of, 2110, (D) 2767
  sunrise effect at Kodaikanal, 1345
  travelling disturbances in, 3294
    diurnal variation of direction of, 2309
  winds in, heights of, long-wave measurements of, 2311
    measurements of, 1996, using 3-receiver technique, 720
Ions, gaseous, recombination of, review of, 999
  motion of, in strong electric field, 376, 1649

L

Laboratories, acoustics, at Physikalisch-Technische Bundesanstalt, Brunswick, 2
  electroacoustics, at School for the Deaf, Worcester, C.P., 3
Lenses, (See also Aerials; Electron lenses)
  ion, grid type, focusing properties of, 3387
  microwave, delay, metal strip, experimental verification of theory of, 3485
    effects of astigmatism on diffraction pattern and gain of, 1597
    excitation and radiation of, 3486
    lattice, for cm waves, 1595
    new type of, 987, 3483
    for phase correction with horn aerials, 1942
    refractive index of delay media for, 3652
    scanning aberrations of, 731
    spherically symmetrical, 1596
    for wide-angle scanning, 3484
  optical and electron, representation of by resistive quadripoles, 3064
  plastic, for high-intensity ultrasonic radiation, 915
Light, nature of, experimental investigations on, 1298
  velocity of, determination by band-spectrum method, 987
Lightning, air discharge and flash to ground, Boys camera study, 1682
    and positive charge at bottom of thundercloud, 1683
  radar observations of, 2003, 3306
  wave spectrum of, and propagation of very long e.m. waves, 802, 1772
Limiters, bandpass, signal/noise ratios in, 3401
  impulse-noise, diode, for mobile v.h.f. receivers, 2780
Loudspeakers, (See also Public-address systems; Sound)
  acoustic damping for, 3179
  baffles and cabinets for, 2201
  characteristics in relation to room acoustics, 3469
  corner-type, historical development of, 3178
  friction-driven, using electromechanical amplification, 614
  horn-loaded, 314
  Ionophone, as ultrasonic generators, 2539
  metal-cone, development of, 18, 313
  and pickups, objective testing of, 19
  reverberation-room measurements of efficiency of, 2873
  subjective and objective tests on, relations between, 2202
  transient distortion in, assessment of, 17
Luminescence, (See also Electroluminescence; Phosphors)
  of alkali halides after c.r. excitation, decay of, 2880
  of layers and films with polyvinyl alcohol as binder, 2955
  quenching action of r.f. field on, 1370

M

Magnetic field, of current element near edge of conducting half-plane, 2967
  above and below infinite corrugated sheet, 2965
  measurement with iron-cored magnetometer, 165
  due to permeable conducting sphere near coil carrying a.c., 2966
  and rotation of massive bodies, negative experiment on, 1333
  of thick plate with semicylindrical edge, 2293
——**force**, practical calculation of, 3587
——**materials**, measurements of moment, susceptibility and permeability, 472
——**properties**, of metals, theory of, 1004, 1005, 1967
  of stainless steel wire, 1708
Magnetism, antiferromagnetism and ferrimagnetism, review of, 1060
  definition of quantities in, 1966
  leakage flux of relays, calculation of, 387
  post-war developments in, 87
  relation between coercive force and crystal energy, 758
Magnetization, spontaneous, of antiferromagnetic single crystal, temperature dependence of, 3336
    condition for vanishing below Curie temperature, 3337
Magnetometers, microwave, based on Faraday rotation in ferrites, 1072
  rotating-iron, 1730
Magnetostriction, of Co and Ni ferrites, 1399
  constants of single crystals, 2045
  factors contributing to overall effect in, 130
  reversal of sign of by expansion, 1711
  in single crystals and multicrystal materials, 1976
  in strong fields, theory of, 3028
Magnets, permanent, iron-powder, 3038
    optimum design of, (A)3039
Mathematics, algebra for networks containing switches, 2913
  boundary-value problems, use of Tchebycheff-polynomial operators in numerical solution of, 2718
  differential equations, of oscillations, numerical and graphical integration of, 1413
    theorem in theory of, and application to analogue computers, 2721
    in theory of forced oscillations in triode circuit, 971
  Dirac's function, application in mathematical physics, 2621
  elliptic functions, coordinate systems associated with, 3347
  Fourier series, tables of, 2360
  Green's functions and impulse functions, tables of, 2360
  integral variant associated with wave equation, 144
  interpolation in series of correlated observations, 2362
  Laplace transformation, general rules for, 764
    interpretation of, 3041
  linear equations, systems of, solution by minimized iterations, 145
  linear stochastic operators, autocorrelation functions of, 3348
  Mathieu-Hill type equations, matrix solution of, 3640
  matrix, formula for power of, proof of, 2258
Mathematics, matrix calculus and use of 'normalized magnitudes' in electrical engineering, 3639
  Maxwell's equations, first boundary-value problem of, 1641
  prediction of nonstationary stochastic processes, theory of, 445
  probability theory, and application to e.m. propagation, 197
  step functions, resolution of, 763
  tabulated values of wave-theory function for complex arguments, 444
Measurement, (See also individual subjects)
  h.f., use of frequency converters in, 155
  techniques, for various components, 457
Metallization, of insulator surfaces, techniques for, 2346
  precious-metal, of insulating materials, and coating test methods, 2052
Metals, band structure of, review of, 2046
Meteors, night-time streams, 1946–1951, radar observations of, 108
  sporadic, velocity distribution of, 1009, 1010
  trail echoes, decay of, 1977, 1978
    double-Doppler investigation of, 398
    experimental study of, 1979
    long-duration, at 33 Mc/s, 2000
  1950 δ-Aquarid shower, radar investigation of, 1320
Meters, grid-dip, u.h.f., using series-capacitance-tuned oscillator, 2080
  ratio, for determination of reflection coefficient of transmission system, 466
  resistance and conductance, electronic, (A)170
  s.w.r., slotted-waveguide, for 9·5-kMc/s band, 3368
    using waveguide squeeze-section and c.r.o., 3066
Microammeters, integrating, for currents > 10^{-8}A, 1431
    d.c., with full-scale ranges from 10μA to 1 mA, 1745
Microphones, absolute calibration methods for, 3173
  capacitor, free-field reciprocity calibration of, 2544
    input resistance of, (D)16
    tension of diaphragms, measurement of, 2200
    Types M49, M50 and U47, 1230
  probe-type, for measurement of sound pressure, 1896
  ribbon-type, directional, 2199
  sensitivity to stray magnetic fields, 1897
  on surface of sphere, directivity of, 613
Microphony, in superheterodyne-receiver oscillators, 814
Microscopes, (See also Electron microscope)
  flying-spot, 1759, 3073
Microwaves, (See also Instruments; Measurement; Wave propagation, e.m.)
  industrial use of, possible dangers in, 1093
  physiological effects of, 2748
Mixers, crystal, microwave, calculations of characteristics of, 2941
  Ge-crystal, for u.h.f. receivers, testing of, 2063
  harmonic, using crystal diodes, 1791
Modulation, a.m., Rothman system of, 1181
  a.m. and f.m., spectra of, analysis of, 2790
  a.m., f.m., and ph.m., theory of, 2439
  comparison of different methods for directional radio links, 2791
  comparison of signal/noise ratios for different methods, 828
  definitions of terms for, 53 IRE 11S1 standard on, 2438
  frequency, by means of reactance units, fundamentals of, 2820
  index, of f.m. signals, oscilloscope determination from stationary phase points, 3071
  low- and high-level, for television transmitters, comparison of, 567, 568
  pulse, multiplex, pulse distributors for, 2142
    new method with reduced bandwidth, 3415
  pulse-code, delta, 3712, principles of, 543, simple method of producing, 2440
    systems of, 3106
Modulators, amplitude, using carrier-frequency switching pulses, 2177
  clamp-valve, carrier control with, 1182
  using class-B amplifiers without grid current, 3949
  frequency, using diode, 2486
    serrasoid, 1846
  using Hall effect in Ge, 1930
  magnetic, for pulsed radar, 2992
  phase, susceptance valves and reactance valves as, 3442
  rectifier, carrier-leak control by use of d.c. meter in, 580
    with frequency-selective terminations, input impedance of, 579
  using transistors, 1514
  for u.h.f. television, using spiral-beam valve, 2188, 2500
Monitoring, of B.B.C. unattended transmitters, 548
  international, E.B.U. station at Jurbise-Masnuy, 3416
  of radio-communication channels, automatic-scanning receiver for, 2129

  stations, N.W.D.R., 2149
Monitors, frequency-shift, c.r., B.T.R., 1436
  panoramic, multiband, v.h.f., for county police and fire-services' transmitters, 544
  for s.s.b. s.w. transmitter, 2175
  for television waveforms, 1736
  for u.h.f. television transmitter, 247
  waveform, Type-500, for recurrent waveforms, 482
Multivibrators, see Oscillators
Music, aesthetics of, conditions relating to, 1882
Musical instruments, electronic, 317
    'chord' organ, 616
    clavioline, 318

N

Navigation aids, (See also Radar)
  aerial, for civil aircraft, review of, 1024
    distance-measuring equipment, 3315
    errors in, dynamic aspects of, 412
Navigation aids, aerial glide-slope receiver Type 154A, 413
    instrument-landing approach-system steering computer, 1369
    loran, continuous-indicating equipment for, 2319, 2998
    punched-card-controlled course-line computer for, 2674
    survey of, 2996, 3419, with special reference to Holland, 2010
  beacon, small, SARAH, for location of lost airmen, 2995
  Decca, chart calculations for, 2009
    French service area and error curves, 3313
    site and path errors over land, 1025
  marine, aboard merchant ships and fishing vessels, 3418
    and radar, in ocean weather ships, 1023
    [illegible] chart-matching devices, 1022
  Rana, 3314
Networks, (See also Circuit theory; Filters)
  analysis by repeated voltage superposition, 655
  bridged-T, equalizing action of, 2254
  delay, with maximally-flat characteristics, applications of, (C)54, (D)2258
  group-delay time in, measurement of, 3659
  gyrator. See Gyrators.
  hybrid-ring, wide-band, for u.h.f., 960
  with input impedance or transfer admittance of constant magnitude or phase for varying load, 2251
  iterated, and application to differentiators, 2253
  ladder, exact amplitude/frequency characteristics of, 1267
    'reciprocal', properties of, 2589
    RX, response characteristics of, (D)3222
  lattice, *RLC*, synthesis of, 3535
  linear, active, transformations of, 956
    algebraic theory of, 3229
    with optimum signal/noise ratios, design of, 1927
    response to input with linearly varying frequency, 664
    theory of, 2245
  nonlinear, multipole, theory of, 3546
    steady-state response of, graphical analysis of, 3540
  notch, design curves for, 2255
  n-terminal-pair, synthesis of, 1617
  parallel-T, dual-input, 3537
    RC, analysis of, 661
  parameters of, determination of at v.h.f., 1435
  passive mathematical 'trees' for solution of, 2587
    measurement of 'A'-matrix elements of, 1605, (D)3227
    2-*n*-terminal, synthesis of, 1616
  phase-shift, simplified treatment of, 3230
  quadripole, analysis by method of general circuit constants, 2252
    cm-λ, experimental determination of characteristics of, 1733
    cm-wave attenuation factor of, measurement of, 2071
    with f.m. or ph.m., harmonic distortion in, 1282
    linear, equalization of transfer characteristics, 1936
    passive, rigorous theory of, 1264, transfer matrix in terms of image parameters of, 1604
    phase and group delay of, 2258
    reactive, impedance-transforming properties of, theorem on, 3541
    with reactive elements, synthesis of, 1263, 3538
    response to discontinuous signals, mathematical theory of, 957
    series-parallel, realizability conditions for, 3225
    synthesis theory for, 3226
    transient response of, calculation of from frequency response, 3542
    including transistors, terminology and formulae for, 2238
    waveform computations by time-series method, 55, 959, (D)1608
  RC, analysis of, 2593
    equivalent *Q* of, 2919, (D)3221
    maximum gain of, 1606
    multimesh, for phase-shift oscillators, 1627
    synthesis of transfer functions for, 1929
    tolerance coefficients for, 3224
    variable-frequency, with single variable element, 958
    3-terminal, cascaded, synthesis of, 656, paralleled, synthesis of, 3536
  reactive T or Π sections, conditions for resolution into matched half-sections, 2590
  RLC, unbalanced, synthesis of, 2256
  second fundamental theorem of, 2585
  with sine-squared impulse response, synthesis of, 348, (D)1609
  stability criterion for, 2231
  containing switches, algebra for, 2913
  synthesis of, approximation method for, 660, (C)2250
    potential-analogue method, 3530
  T, applications of, 1928
    resistive, as bidirectional couplers, 2592
  theorem for, and applications of, 62
    critical discussion of, 1607
  theory of, practical significance of complex frequencies in, 657
    Wiener's theory of stationary time series, 328
  time-equalizer, variable, for video-frequency waveform correction, 1178
  transformations to equivalent forms, 2586
  transformer, ideal, theorem on, 1266
  transient phenomena in, calculation by means of Fourier integrals, 1926
  varying-parameter, *n*-mesh, stability of oscillations in, 1271
  2-terminal, impedance functions of, 2248
    nonlinear, theory of, 3220
    theorems on, 3532
  2*n*-terminal, with minimum number of elements, synthesis of, 3228
  3-pole and multipole, equivalent circuits using negative 2-pole elements, 2247
Noise, (See also Atmospherics; Cosmic radiation; Solar radiation; Sound)
  acoustic, in sea, and sound-signal reception, 166
  in a.m. amplifiers, 368
  background, effect on frequency of valve oscillators, 1945
  carrier frequency, on power lines, 3703
  comparator, microwave, N.B.S., 208
  in conductors, differential law of thermal electrical fluctuations and influence of skin effect, 2951
  contact, in CdS single crystals, 3023
    in semiconductors, 2334, 3022
    temperature dependence of, 2952
    theory of, 79
  current, in Ba-Sr-oxide coating, 1522
    in metal contacts, 3498
    in semiconductors, 748, re-examination of Bernamont's data on, 747
  in damped oscillatory circuits, quantum effects in, 3243
  in diodes, power spectrum of, and valve conductance, 1196
  in electron streams, calculation of, 891
  eliminator, 'codan', for a.m. receivers, 2132
  flicker, due to interface layer in oxide cathodes, 1531
  flicker-effect constants, measurement of, 2725
  flicker and shot, space-charge reduction of, 281
  in Ge filament, 122
    effect of magnetic field on, [illegible]
  generator, for S and X bands, 788
  intermodulation, in multichannel telephony systems, 822
  low-frequency, in electrometer valves, measurements of, 1185
    in valves, 1192
  mathematical representation of, 893
  measurement, accuracy of, with square-law detector, 2724
    and assessment, 3406
    53 IRE 7S1 standard on, 3055
  in microwave superregenerative amplifier, 1948
  narrow-band, probability density of, 816
  in receivers and amplifiers, survey of, 815
  reduction, in intercommunication systems, 2787
  r.f., from h.v. power lines, and power-line design, 927
  in screen-grid valves, 1538
  shot, in gas discharges, 2185
    in Ge filaments, 2035
    in semiconductors, calculation of, 2040
  in sound recording and reproduction, 53 IRE 19 S1 standard on methods of measurement of, 1900
  in telecommunication cables, measurements of, 3182
  thermal, clipped, autocorrelation function and power-density spectrum of, 532
  transistor, circuit problems of, 643
    meter for, 2385
  in transistor amplifiers, 1288, 2279
  valve, 1864
    at frequencies > 10^8 c/s, 907, 3758
    low-frequency, measurements of, 1202
    due to oxide-cathode interface resistance, 1530
  at very low frequencies, in semiconductors, 2039
  v.h.f., total, measurements of at typical sites, 817
  v.h.f. receiver design in relation to, 1789
Nucleonics, industrial applications of, 495
    β-particle and γ-ray thickness gauges, 496

O

Optics, brightness flicker, investigation of, 1841
  direct-vision stereo-projection screen, 375
  wave and ray, in inhomogeneous absorbing media, 2954
Oscillations, a.m. and f.m., interfering, effective value of, 1475
    spectral differences between, 2484
  of biaxial anisotropic parallelepiped, 1315
  of conducting sphere surrounded by air and ionosphere layers, 3596, 3597
  electrical and acoustic, build-up phenomena of, 1626
  in electrical circuits, analysis in terms of modulation products, 2264
  forced, in cavity resonator and coaxial-line system, theory of, 1622
    with nonlinear restoring force, 1940
    in triode circuit, theory of, 971
  in *n*-mesh varying-parameter networks, stability of, 1271
  nonlinear, forced, exact solutions for special cases, 2622
    periodic, stability of, 2361
  in nonlinear electromechanical systems, theory of, 3556
  relaxation, coherent theory of, 694
  subharmonic, in nonlinear systems, 2953
  in whole-anode magnetron, 904
Oscillators, (See also Circuits; Signal generators)
  a.f., transistor, low-drain, 679, for 20, 200, 2000 and 20000 c/s, 3517
  amplitude-limited, synchronization-range determination of, 1943
  amplitude-stabilized, use of servo techniques in design of, 2937
  analysis of, admittance diagrams in, 1944
  arc and dynatron, solution of 'Rukop problem' for, 2602
  beat-frequency, high-stability, 0·25–10 Mc/s, 1628
  blocking, low-power, 2936
    operation and applications of, 2606
  constant-amplitude, using clamp valve, 970
  with constant output voltage, 2939
  crystal, fundamental-frequency and harmonic, analysis of, 358
  decade, precision, 1-c/s–100-kc/s, (D)2604
  feedback, travelling-wave-valve, 276
  filtered, calculation of attenuation in, 2449
Oscillators, filtered, nonlinear, pull-in of, 972
    perturbations of, 1279, 1624
  f.m., quartz-crystal stabilized, 1277
    using transistor and titanate capacitor, 2938
    wide-band, with double-phantastron circuit, for data transmission, 3559
  frequency stability of, methods of improvement of, 1513
  frequency-sweep, S-band, and test set, 3671
    use of variable inductance in, 683
    wide-band, 35–900-Mc/s, for testing television equipment, 486
    X-band, 973
    470–890-Mc/s, with crystal calibrator, 487
  grounded-grid, with disk-seal valves, self-excitation of, 3245
  harmonic, using iron-cored reactor, 2455
  h.f., quenched-spark, mains-loading calculation for, 361
    for regulation and control of aircraft v.h.f. equipment, 3240
  impulse-governed, high-stability, 2607
  klystron, coherence of microwaves generated by, 2943
    long-line effects on, 363
  LC, synchronization of, mechanism of, 2940
  linear, frequency stability of, effect of noise on, 362
  locked, frequency spectrum of, 2605
  low-frequency, 0·01-c/s–1-kc/s, with output of sinusoidal, square or triangular waveform, 680
  microwave, stable, for measurement of atmospheric refractive index, 1085
  multiple-feedback, wide-range, 969
  multivibrator, anode-coupled, triggering of by negative pulses, 3557
    transistor, pulse duration and repetition rate of, formulae for, 682
  nonlinear, with noise perturbation, power spectrum of, 968, 2334
    and Nyquist diagram, 1625, generalization of, 2232
    second-order, analysis using concept of moving poles, 2601
  pulse, hard-valve, 364
    locked oscillator, 2945
    mains-frequency, simple type of, 488
    phase-shifting, for thyratron control, 1629
    reciprocal-function, 2946
    'sine-squared', for testing television links, 1069
    for testing digital computers, 489
    wide range, 3672
  quartz-controlled, stability of, 1274
  RC, cathode-coupled and transitron, 2935
    with electronic tuning, 1638
  sawtooth-waveform, for recording time intervals, 152
  square-pulse, high-power, 1086
  square-wave, 2944
  test-pattern, for production testing of television receivers, 2748
  transistor, 45
    analysis of, 678
    frequency-substandard, 2064, 3051
  travelling-wave-valve, 1872, 3750
  ultrasonic, ionophone, 2539
    magnetostrictive, 1556
    whistle type, using gas and liquid jets, 1879
  valve, effect of background noise on frequency, 1945
  variable-frequency, synchronization by use of E80T valve, 2816
  v.h.f. and u.h.f., with single-crystal control, 975
  Wien-bridge, design curves for, 1278
  220 Mc/s, with TBW 6/6000 or TBL 6/6000 transmitting valve, 2270
  6-waveform, with display unit, for testing television channel, 1067

P

Particle accelerators, betatron, monitor and integrator for, 2754
    theory, development and applications of, 3381
  betatron and synchrotron, automatic ejection from, 3677
  cyclotron, electric fields in dees of, 1765
    at Stockholm, initial performance of, 506
    86-in., Oak Ridge, 181
  direct-voltage generators, focusing system for, 1099
    linear, ion optics of, 2089
    portable, 250-kV, 3679
    telemetry system for, 794
    1·5-MV, for heavy particles, at Stockholm, 508
  electron cyclotron (microtron), phase stability of, 2090
  linear, for electrons, with constant wave speed, axial motion of electrons in, 3077, using corrugated waveguide, 507, multicavity, 509, standing-wave, for 1·2 MeV, 3078, waveguide type, 2407
    for ions, motion of ions in, 2755, effect of accelerating-field variation on, 3079
    for protons, new focusing principle for, 1766
    radial focusing in, 1455
    waveguide, dielectric loading for, 2408
  synchrocyclotron, at Amsterdam, 3076
    perturbations in magnetic deflector for, 2091
    for 450-MeV protons, 1764
  synchrotron, electron, characteristics of beam in, 2752, energy loss in, 3380, theory of, 182, 35-MeV, 2093
    proton, at Birmingham, 2092, cosmotron, effect of magnetic defects in, 2753, focusing method for, 2406, strong-focusing, 1454, 3678, strong-focusing, elimination of effects of faulty alignment in, 2405
Particles, charged, motion in e.m. field of linear current and e.s. field of cylindrical capacitor, 75
Permeability, complex, and dielectric constant, measurement of at u.h.f., 2381
Permeability, determination of, optical method for, 995
  measurement, for large iron sheets, 3061
    for rod specimens, 1429
Perturbation theory, accuracy of calculations from inaccurate unperturbed wave function, 3254
Phase angle, and gain, measurement set for, (A)2738
  changing, for sinusoidal l.f. voltage, 330
  comparator, precision, for low radio frequencies, (A)483, 1080
  delay, in television transmission circuits, measurement of, 1750
  measurement, with c.r.o., 1739, accuracy of, 1740
    use of microwave homodyne in, 1741
  meter, 2741
  shifter, for range 10–100 Mc/s, 3357
    variable, potentiometer-type, low-cost, 640
    waveguide, for microwave measurements, 1440, modified magic-T, for microwaves, 331, wide-band, 2567
Phosphors, alkaline-earth orthophosphate, 3610
  CdS crystals, electrical conductivity of, 1026
    luminescence and conductivity on irradiation with α particles, 1371
  crystal, mechanism of phosphorescence in, 1643, 2624
  for flying-spot c.r. tubes, 3608
  intrinsic efficiencies under c.r. excitation, 3607
  light emission and light quenching under electron and ion impact, 734
  sulphate-base, thermoluminescence of, 3006
  for television c.r. tube screens, 1869
  transfer and transport of energy by resonance processes in, 372
  ZnF_2, luminescence decrease due to electron irradiation of, 3322
  ZnS, absorption and emission spectra of, 2023
    electronic transitions in luminescence of, 2679
    fluorescence centres and traps in, 2024
  ZnS-Cu, continuously excited, effect of electric field on, 2284
    influence of fineness of material on luminescence of, 2022
    with yellow and red emission, 3609
  Zn_2SiO_3-Mn and ZnS-Cu, field emission of, 3321
  Zn_2SiO_4, field-dependent luminescence of, 418
  Zn_2SiO_4-Mn, interaction of Mn ions in, 2323
  (Zn, Cd)S, induced conductivity of, 2021
  (Zn, Cd)S-Ag-Au-Al, with white fluorescence, for television tubes, 111
Photocells, Ag-Cs, fatigue effects in, 3137
  Ag-Cs_2O-Cs, pulse irradiation of, 3448
  application of, control of tracing head of oxy-acetylene cutter, 180
    register control, 1096
  barrier-layer, laws governing characteristics of, explanation of, 3141
  utilizing carrier injection in semiconductors, 888
  electron-multiplier, 1853
    cascade-type, remodulation in, 1519
    dark current of, 1518, 2492
    infrared-sensitive, 1520
    for scintillation counting, 266, 2181, 3748
  flying-spot scanner for study of surfaces of, 890
  Ge, comparison of three types of phototransistor, 2825
    p-n junction, Type M-1740, properties of, 889
  PbS, properties of, 2677
  PbSe, in infrared spectroscopy, 3142
  Sb-Cs, alternating component of photocurrent under strong illumination, 3138
  Se, barrier-layer, barrier-height in, 1852
  Se and Ag_2S, current sensitivity of, effect of electron stream on, 3140
  Se-CdO, mechanism and applications of, 3449
Photoconductivity, of anodic Ta_2O_5, 733
  'barrier layer' and 'concentration' theories for, choice between, 3605
  of CdS crystals at relatively high temperatures, 1687
  of CdS single crystals at edge of absorption band, 1691
    growth and decay of, 1688
  of Cs_3Sb, and thermo e.m.f., 3002
  infrared, of Si at low temperatures, 2014
  of orpiment, 415
  of PbS, absorption spectra of at various temperatures, 2020
    and conductivity of, effect of oxygen on, 3040
  of PbS layers, properties of, 2706
  of ZnS, measurements on single crystals, 732
Photoelectric effect, internal, electron-optical investigation of, 3606
  in natural PbS, (C)2013
——**emission**, (See also Cathodes)
  of BaO, 2322
  of CdS and CdSe, field-type, 1391
  of CdS-Cu, at infrared λ, 2012
  of Cs_3Sb, and energy structure of, 3004
    measurements of energy distribution of, 1690
  of Cs_2Te and Rb_2Te, 1689
——**materials**, Cs_3Sb, electrolytic conduction in, 2676
  PbS, noise measurements on thin layers, 3003
  PbS, PbSe and PbTe, optical constants of in 0·5–3-μ wavelength range, 2018
  PbTe and Si, optical constants of, interrelation between, 2017
Photography, image converters as high-speed shutters in, 2751
Photomagnetoelectric effect, in semiconductors, measurements on Ge, 2016
    theory of, 2015
Pickups, and loudspeakers, objective testing of, 19
  piezoelectric, crystal, 1904
Piezoelectric crystals, (See also Quartz)
  ADP, deuterated, properties of, 1044, theoretical interpretation of properties of, 1045
  $BaTiO_3$ ceramics, properties of, 1042
  for pressure, temperature and humidity measurements, 2403
  quartz and synthetic-crystal resonators, 1376
Piezoelectric crystals, for radio applications, properties of, 3635
  Rochelle salt, under compressive stress, voltage measurements on, 735
    measurement of dielectric constant at 3 kMc/s, 2729
  sound-wave propagation in, theory of, 3014
  thickness vibrations of, 357, 3553
Piezoelectricity, ferroelectricity, and crystal structure, 699
Plasma, in crossed electric and magnetic fields, 3591
  electron, longitudinal waves in, 1310
  gas-discharge, absorption of microwaves by, 2970
  in magnetic field, theory of, 1964
  moving, origin of magnetic fields in, 1985
  with neutral gas, dynamics of, 1309
  oscillation, relation between various types of, 1965
    and solar 'enhanced radiation', 1322
  propagation of e.m. waves in, 1659
  with variable current, theory of, 386
Potential, barrier, between electrodes with different applied potentials, 2628
    theory of, 2629
  contact. See Contact potential.
  in electrically shielded space, variations of, 1646
  isolating comparator for, 3064

due to uniformly charged disk, calculation of, 1651
vector, derivation from scalar potential, (A)2285, 3574
Power measurement, at h.f., using thermistors, 1441
microwave, absolute, radiation-pressure method for, (D)1071
at u.h.f., mismatch errors in, 3661
meter, for microwaves, 786
supplies, a.c., constant-voltage, (D)168
bridge circuit for feeding several loads, 1491
constant-voltage, for transistor circuits, 2797
d.c., stabilized, using glow-discharge regulator tubes, 231
h.v., corona-stabilized, for proportional counters, 1803, low-current, using transistor oscillator, 833
small, effective current and efficiency of, 2799
stabilized, 552, for electrometer valves, 1133
stabilized rectifier unit for 5 kV, 50 mA, 2800
for transmitters, 2454
vibrators and vibrator power packs, recent developments in, 228
50–300-V, 2152
0·5–3-kV, using r.f. oscillator, 1134
25-kV, using r.f. oscillators, 553
600-VA, thyratron inverter circuit for, 1490
Public address systems, portable equipment for, 1899
for power stations, 615, 3470
Pulses, amplitude spectrum of, and pulse technology, 3105
coding and decoding by passive networks, 2441
sine-squared, for television testing, 3377

Q

***Q* factor,** measurement of, 775
chart for use in, 464
frequency-sweep method for cavity resonators, 465
meter, correction abac for errors due to valve-voltmeter loading, 783
Quadripoles. See Networks, quadripole.
Quantum theory, of fields, mathematical aspects of, 1289, 1290, 2620
relation to theories of gravitation and electromagnetism, 3570
soluble problem in energy bands, 391
Quartz, crystals, h.f., for filter networks, 3552
internal friction of, 2349
operational characteristics of, 140
resonators, design and applications of, 441, harmonic oscillations of, 1619, impedance meters for, 2390, measurement of parameters of, 3670, mechanical loading for adjusting frequency of, 966, in parallel-resonance circuits, activity measurement for, 1273, tuning-fork type, for 1–20 kc/s, 2267, variation of resonance frequency with pressure up to 5000 atm, 442, 100-kc/s, high-stability, 1063
fused, for ultrasonic delay lines, 3637
variation of conductivity of, 1378

R

Radar, (See also Aerials; Lenses; Navigation aids)
applications, measurement of velocity of projectiles, 174
back-scatter from cylindrical wires, 96
and detection of icebergs, etc., 2673
displays, c.r. tube, quality factor for, 2317
p.p.i., moving-target indication systems, 2672, television unit for, 2001
remote, Decca link equipment for, 2005
special type of p.m. transmission system for, 'Durchmusterung', [illegible]
echoes, and lightning, 107
from precipitation, the 'melting band', cross-polarization of, 1364, 'melting-band' phenomena in, 2314
from rain, 2994, from non-freezing clouds, 2004, at Sydney, New South Wales, 3312
echoing-area measurements on models, use of dielectric lenses in, 1366
equipment, for moving-target indication, measurements on, 1446, at Orly, 3316
marine, 3-cm/10-cm equipment for merchant ships, 730
omnidirectional reflector system for, 1684
optimum pulse-integration angle and system sensitivity of, 2671
panoramic, cinematographic recording equipment for, 2007
port equipment, Decca, demonstrations at Hamburg and Bremen, 1360
Radar, port equipment, installations at Boston, Long Beach, New York and Liverpool, 1685
pulsed, magnetic modulators for, 2992
search, for civil aircraft, 109
training apparatus for air-traffic control, 1368, 3319
Radiation, (See also Aerials)
detectors, phosphor-photocell, Type AN/PDR-18, 1103
Radio astronomy, See Astronomy, radio.
communication, international organization of, and world problem of frequency allocation, 2785
engineering, sources of information on, 2192
progress, I.R.E. review for 1952, 2527
station, at Lüchow, West Germany, organization and installations of, 2444
technology, applications of theory of numbers in, 3346
Radio links, (See also Communication systems; Radiotelephony; Relay systems; Television)
cm-λ, Manchester/Edinburgh, travelling-wave valves in, 2829
directional, in Western Germany, and equipment for, 2140
f.m., microwave, multichannel, design of, 217, multichannel, wide-band circuit technique for, 220
for telephony, experimental equipment for 420–470-Mc/s and 860–960-Mc/s, 3412
km-λ, intelligibility in, and mean level of atmospherics, 105
microwave, measurement techniques and components for, 219
4-kMc/s, path attenuation measurement for, 1091
multichannel, u.h.f., between Mestre and Trieste, 3109
s.w., s.s.b. multichannel operation of, 2144, 2175, 2425
in U.S.A., survey of, 545
u.s.w., graphs for design calculations, 2118
Radiosonde, automatic radar system operated by British Meteorological Office, 3675
improved, 497
without responder, pulse observations of wind by, 2993
Radiotelegraphy, (See also Communication systems)
percentage of error signals received, recorder for, 3696
smallest permissible frequency separation between transmissions, 540
Radiotelephony, (See also Communication systems; Radio links; Relay systems)
beam link, f.m., u.s.w., multipath distortion in, 218
beam-system, p.ph.m., channel separation in, 1788, 12- and 24-channel, 822
Israel intercity, f.m., 250-Mc/s, 2442
mobile, transmission problems of, [illegible] 3417
multichannel equipment for Eindhoven–Tilburg link, 546
new terminals of Centro Radio Nazionale P.T., 2793
Rhine ship service, propagation tests for, 542
s.s.b., 4–23-Mc/s, 4-channel equipment for, 541
for trains, German investigations on, 225
Reactors, saturable, with inductive d.c. load, steady-state operation of, 3527
as reference source for magnetic amplifiers, 2237
Receivers, (See also Radar, Television)
all-wave, 100-kc/s–30-Mc/s, Type-E 103AW/4, 207
a.m., noise eliminator for, 2132
broadcasting, a.m./f.m., for comparing transmissions in the range 87·5–95-Mc/s, 2121, new trends in design of, 2427, using new valves, 204
u.s.w., development of circuit and valves for, 2428
VVB-RFT, at the Leipzig Fair, 810
communication, band-spreading, method for, 812
easily demountable, 526
s.w. superheterodyne, design of, 3697
definitions of terms, 52 IRE 17S1, standard on, 811
d.f., matched-channel, phase and gain stabilization in, 2320
long-wave, stable, for space-wave measurements, 2123
miniature, for Palais de Chaillot N.A.T.O. translation service, 2794
monitoring, with automatic frequency-sweep device, 2122
for r.f. noise measurements, 3402
space-diversity, a.f. combining system for, 2426
subcarrier, 1-Mc/s, for f.m. multiplex system, 3099
superheterodyne, cm-wave, noise factor of, 1790
with crystal mixer, sensitivity and noise factor of, 2127
dust-core-tuned, design of, 528
impulse response of, operational analysis of, 1115
microphony in oscillators in, 814
radar, second-detector signal/noise improvement in, 527
tracking methods for, 2126
using transistors, (A)3403
s.w., independent-sideband, 2425
signal/noise ratio of, dependence on input voltage of, 2125
and transmitters, for citizens' radio, 2437
v.h.f., noise performance of, 1789
Reception, (See also Field strength; Television; Wave propagation, e.m.)
decametre-wave, Paris/New York, deterioration of since Aug. 1950, [illegible]
of frequency-shift signals from s.w. transmitters, 3399
of pulsed carrier waves in noise, statistical criteria for, 2782, 2783
of signals in noise, nonlinear filters for, 206
optimum filters for, 205
of sine wave in Gaussian noise, 2429
of 1–10-c/s signals in noise, commutator device for improvement of, 2784
Recorders, (See also Sound recorders)
frequency, electronic, automatically calibrated, 10–130-c/s, 2377
ionosphere, automatic, for range 0·6–25 Mc/s, 3356
panoramic, 16-kW, 1–20-Mc/s, 3052
Recorders, ionosphere, 50-kc/s–1-Mc/s, 1998
1–20-Mc/s, 1-kW, Netherlands P.T.T., 2989
keep-alive arrangement using 10-c/s multivibrator, 473
Numerograph, for digital computer, 1726
pulse, with timing trace, 2379
tone-pitch, for phonetics research, 1226
Recording, (See also Sound recording)
field-strength, 'fixed-level' method of, 2065
Rectification, (See also Semiconductors)
thermal, in semiconductors, 3015
Rectifiers, (See also Valves, crystal)
barrier-layer, barrier height in, 1852
theory of, 2038
crystal, CdS, properties of, 3136
Cu_2O, zero-bias resistance of, temperature dependence of, 3345
Cu_2O, CuS and Se, developments in, 2154
electrolytic, Al-Al_2O_3, impedance of, 2801
Ge, 2698
contact-p.d. of, changes of during forming, 3260
diffusion theory of, effect of high-field mobility in, 2697
forming of, investigations of, 2032
p-n-junction, medium-power, 835, power-unit, 834, temperature dependence of backward current in, 423
point-contact, reverse characteristics of, 1715
and transistor, theory of, 2821
harmonic-insensitive, for a.c. measurements, 3662
Hg-arc, Nevitron, 836
Mg-CuS, hermetically sealed, 2153
output-voltage control by transductors, 839
point-contact, effect of minority carriers on breakdown of, 437
power-läw, output signal/noise ratio of, 3405
Se, blocking mechanism of, 2699
capacitance of, 1802
electron mutiplication in reverse operation of, 2350
temperature variation of characteristics of, 1389
40-V, development of, 2457
Si, point-contact, effect of heat treatment on, 1714
solid, dynamical theory of, 3630, 3631
TiO_2-film, 229
valve, high-power, h.v., 2155
Reflection, (See also Sound; Wave propagation, e.m.; Waves)
coefficient, of stratified medium, use of calculus of variations for determination of, 1314
of transmission systems, determination of, ratio meter for, 466
of e.m. waves, from regions of refractive-index gradient in atmosphere, 1780
from rough sea surface, 1106
of microwaves, from ground and water surfaces, 1787
by metal-plate structures, 389
of sound or e.m. waves from point source at plane boundary, 2540
Reflectometer, directional-coupler, for measurements in s.w. range, 477
waveguide, wide-band, recording, 488
Refractive index, of air/water-vapour mixtures at dm λ, 1642
r.f., of atmosphere, constants in formula for, 1990, 3287, measurement of variations of, 1085, rapid variations in, 481, slide-rule computation of, 1014
vertical and horizontal distribution of gradient of in troposphere over U.S.A., 1991
of water vapour, air, O_2, N_2, H_2, D_2 and He at 9·2 kMc/s, 2062
Regulators, alternating-voltage, electromechanical, 3726
current and voltage, using reference standard, 3725
direct-voltage, electronic, 1804
for kilovolt range, 838
variable, using cold-cathode triode, 554, (D)1805
speed, electronic, theory of, 1451
voltage, using nonlinear elements, 230
Relay systems, (See also Communication systems; Radio links; Radiotelephony; Television)
microwave, in Europe, North Africa, Near East and Australia, 3108
multichannel, Australian, 3110
TD-2, station equipment for, 216
u.h.f., planning of, 1126
Research, radio, in British Commonwealth, 2528
on radio and electronics, in Russia, 2525
on tropospheric e.m. wave propagation, at N.B.S., 2768
Resistance, a.c., realization of, 3493
h.f., apparent, of conducting strip parallel to conducting plane, 80
Resistivity, of Bi, variation in magnetic field of, and Corbino effect, 1710
of cold-worked metals and alloys, effect of temperature of deformation on, 1027
of metals, at high current density, with pulsed operation, 1377
in magnetic field, theory of, 378
of refractory oxides at 600–1500°C, 2684
variation in magnetic field, mechanism of, 377
Resistors, borocarbon, characteristics of, 340
carbon-film, temperature coefficient of, 1921
for 200-°C, production of, 947
coated-glass, E-C, 1253
fixed, developments in, review of, 946
nonlinear, shaping of characteristics of, 341
printed, production control of, 47
Russian notation for value of, 2927
standard, a.c., 3360
Au-Cr, 772
thin-film, disk-type, for r.f. micropotentiometer, 3525
10^9–$10^{11}\Omega$, measurement of, 3056
$>10^{11}\Omega$, methods of measurement of, 459
Resonance curves, simple explanation of, 675
Resonators, (See also Piezoelectric crystals, Quartz)
acoustic, Helmholtz, in B.B.C. studio at Swansea, 309
spherical, effect of viscous dissipation on, 1564, (C)3172
tubular and hollow brick types, absorption by, 310
cavity, coupled, resonance frequencies for, 1621
containing crystals, e.m. oscillations in, 1315, 1623
operating in degenerate modes, perturbation effects in, 360
double-loop-coupled, analysis for, 967
with finite wall conductivity, natural e.m. oscillations in, 67
influence of surface finish and atmospheric conditions on, 2932
lossless, with hole excitation, e.m. field in, 2268
microwave, interaction of modes in, 2933
Q measurement for, frequency-sweep method of, 465
dielectric-cylinder, high-permittivity, quasi-degenerate modes in, 1942
magnetostrictive, ferrite, and applications, 2229
vibrating-wire, high-*Q*, 3561
Response, of linear time-dependent systems to white noise, 2856

S

Sampling, sequential, for attributes, theory of, 2715
Scattering, (See also Sound; Wave propagation, e.m.; Waves)
of e.m. or sound waves, by grating, 695
by irregular surface, 2968, 2969
Screening, of electrical equipment, design of mesh networks for, 2796
of test rooms and instruments, 3116
Sealing, by optical polishing, 141
Seals, enamel, for mica windows in G-M tubes, 3638
glass/kovar, hermetic, 2711
glass/metal, fundamentals of, 2712
high-conductivity, 142
hermetic, 2356
Semiconductors, adiabatic Hall effect in, 3018
alternative theories of, 78
anthracene single crystals, electronic conductivity of, 3016
BaO, diffusion of Ba in, 432
BaO single crystals, Hall effect in, 129
boron, electrical and optical properties of, 1696, 2031
CdS, rectifier properties of, 745
CdS single crystals, contact noise in, 3023
ceramic, 'Caslode', for microwave power absorption, 2029
conduction in, influence of state of division on type of, 2686
contact noise in, 2334, 3022
contact phenomena in, theory of, 2687
copper sulphides, electrical and optical properties of, 1028
Cu_2O, high temperature conductivity measurements on, 1386
low-temperature conductivity of, dependence on oxygen pressure during annealing, 1385, 1387
optical absorption in, effect of lattice defects on, 1384
production methods for stability of, 1383
properties of, 1701
thermoelectric measurements on at high temperatures, 3613
current carriers in, added, transport of, 3611
determination of effective mass of, 1381
current noise in, 748
re-examination of Bernamont's data on, 747
cyclotron resonances, magnetoresistance and Brillouin zones in, 3017
diffusion constant and electron and hole mobility in, verification of relation between, 1305
drift mobility in, measurement of, 1379
effect of electron surface state on optical properties of, 1304
electron spin in, 1960
energy states of impurity carriers in, 1382
ferrites, magnetodynamics of, 1029
GaAs and InAs, preparation and properties of, 3325
Ge, acceptors produced by quenching of, 1407
contact resistance of, 1030
Cu as acceptor element in, 119
effect of magnetic field on noise in, 2695
effective mass and relaxation time of conduction electrons in, 2330
elasticity and thermal expansion of, 2348
electron mobility in, 425
energy-band structure of, 1699
filaments, shot noise in, 2035
grain-boundary barriers in, 1406
Hall effect in, three applications of, 1930
heat-treated, infrared absorption of, 2678
high-field mobility in, with dominant impurity scattering, 3328
large-area contacts on, properties of, 118
lattice defects, heat-treatment-induced, 1697, activation energy of, 742
lifetime of carriers in, 740, 741
microwave measurements on, 3618
n-type, low-temperature Hall curve for, 426, single-crystal, effect of heat treatment on, 2333
noise in, 122
observations of dislocations in boundaries, 2693
p-type, contact properties of, 117, infrared absorption bands of, 424
photomagnetoelectric effect in measurements of, 2016
plastic deformability at relatively high temperatures, 2033
p-n junction, electronic states under strong applied fields, 736, fused-impurity, impurity diffusion and space-charge layers in, 3020, pressure-welded, 2034, production by diffusion, 739
production, properties and applications of, 1405
radiative transitions in, 2331
Semiconductors, Ge, recombination rate in, determination of, 2692
relation between charge-carrier and pulse drift mobilities in, 3617
solute distribution in, 3343
space-charge-limited hole current for high applied voltages, 3329
surface forming of, 3330
surface properties of, 1698
temperature dependence of drift mobility in Ge, 2332
thermal conversion of, impurity effects in, 116
thin films, Hall constant and resistivity of, 3615
ultrasonic-attenuation measurements in, 2694
uses in telecommunications technique, 1850
Ge single crystals, apparatus for production of, 2707, optical constants of, 3344, preparation of, 744, (C)1408
Ge and Si, diffusion of Li into, 3616
electron traps in, 2691
field dependence of mobility in, 3326
physical properties of, 738
plastic deformation of, 1403, 1404
solubility in Ga and In, 3033
Ge, Si and Hf, isotopic constitution of, 3341
haematite, crystal structure and antiferromagnetism in, 1311
thermomagnetic properties of, 2705
intermetallic compounds, CdSb, properties of, 3619
InSb, magnetoresistance effect in, 2696
InSb, GaSb and AlSb, 2688
K-Sb, Cs-Sb K-In and Cs-In systems, properties of, 2030
iron-oxide agglomerates, conduction mechanism in, 114
iron-oxide-mixtures, lattice defects and Debye r.f. absorption in, [illegible]
magnetoresistance of, theory of, 2329
metal contact with, theory of, 379
micromanipulator for location of point contacts on, 2999
mixed *n*- and *p*-type, theory of, 2028
molybdenite, electrical properties of, 2708
oxides, variations of lattice parameters of, 115
PbS, band structure, investigation by cellular method, 2037
sintered, conductivity and Hall coefficient of, 120
transistor action and related phenomena in, 2036
PbS, PbSe and PbTe, intrinsic conduction in, 1388
PbTe, investigation of transistor action in, 1409
photomagnetoelectric effect in, theory of, 2015
p-n junctions, production of, by variation of crystal-growth rate, 743
revealed by electrolytic etching, 3332
theory of noise in, 871
porous, conductivity of, 737
properties and applications of, 427, 1703
recombination of holes and electrons in, statistics of, 420
rectifying pairs, relaxation processes in, 3620
resistance/temperature characteristics of, measurement of, 3614
Sb_2S_3 and Bi_2S_3, electrical properties of, 3019
Se, amorphous and hexagonal, optical absorption and reflection of, 2019
multicrystal, electrical properties of, 2690
shot noise in, calculation of, 2040
Si, effective mass of conduction electrons, 421
energy-band structure in, 3327
n-type, powdered, electron-spin resonance absorption in, 3342
p-type, thermoelectric constant of, 82, 2335
resistivity and thermionic emission of, 3333
single crystal rods, 422
space-charge-limited emission in, 3324
'swept intrinsic', field distribution in, 2689
Te-film, effect of electric field on conductance of, 1695

Te single crystals, infrared transmission of, **417**
technical vocabulary for, French, **1702**
thermal rectification effect in, **3015**
thermo- and galvano-magnetic coefficients for, **1380**
various, transistor properties of, **121**
ZnO, photodielectric effect, ferroelectricity and thermoluminescence of under ultraviolet excitation, **3005**
sputtered layers, effect of dissolved oxygen on electrical conductivity of, **1031**
study of lattice defects by r.f. spectroscopy, **1700**
Servomechanisms, (See also Control systems)
a.c., compensation networks for, graphical synthesis of, **2448**
effects of carrier shifts on derivative networks for, **2452**
airborne, discriminators for, **3422**
application of nonlinear techniques in, **3111**
carrier-frequency, synthesis of compensation networks for, **3115**
closed-loop, reduction of forced dynamic error in, **3423**
comparators for, **3113**
using compensated magnetic amplifier, **3114**
conditionally stable feedback systems for, design of, **2453**
design of, analogue computer for, **1055**
using filtered oscillators, stability of, **2449**
for heterodyne-oscillator drive, **2378**
instrument, damper-stabilized, design of, **549**
linear, solution by means of equivalent network, **550**
multiple, stability of, **227**
nonlinear, **831**
with filters, transients in, **1130**
transient response of, **3112**
with nonlinear friction, operating modes of, **3421**
remote-position-control, hydraulic, and analogue computer for, **1054**
sampling, application of pulse transfer function to, **1131**
second-order, **3420**
saturating, phase-plane analysis of, **2447**
Servomechanisms, survey of, **830**
synthesis of by root locations, **(A)2150**
theory of, formula for integral occurring in, **832**
transient performance calculation from db/log f plots, **3721**
use of rotary amplifiers in, **2451**
variable-carrier-frequency, stabilization of, **551**
with variable elements, stability of, **3723**
theory of, **1800**
Signal generators, (See also Generators; Oscillators; Test equipment)
covering range 20–1200 Mc/s, **1084**
spurious f.m. in, **3562**
giving stepped signal corresponding to graded greys, for television testing, **565**
two-range, **485**
Signal/noise ratio, l.f., decrease of when increasing i.f. bandwidth, using square-law or linear detector, **3404**
for various modulation systems, **828**
Signals, analytical, with limited spectra, **2137**
and synchronization of amplitude-limited oscillators, **1943**
and linear transmission operators, analysis of, **3703**
pulse, with thermal noise, optimum clipping for, **2781**
Skin effect, anomalous, in metals, at low temperatures, **1303**
in conducting materials, chart for, **435**
Slide rule, vector, **2714**
Solar activity, correlation with atmospheric pressure fluctuations, **1323**
correlation with geomagnetic activity, **1011**
correlation with geophysical phenomena, **1983**
——**corona,** and geomagnetism, **1326**
observations at eclipse, 25th Feb. 1952, **716**
——**flares,** and magnetic storms, **3276**
——**radiation,** effects of, in upper atmosphere, **1321**
r.f., from corona, at 10 cm–10 m λ, **3277**
dm-λ, asymmetry of, **3273**
'enhanced', and plasma-oscillation theory, **1322**
inadequacy of thermal theories of, **1980**
m-λ, origin and characteristics of, **2971**
outbursts at 8·5-mm λ, **93**
during solar eclipse, 28th April 1949, **3402**
during solar eclipses, 1st Sept. 1951 and 25th Feb. 1952, **94**
from sunspots, directivity of, analysis of, **1981**
Soldering, by dip method, for radio and television receivers, **2710**
Sound (See also Absorption; Acoustics; Diffraction; Reflection; Wave propagation; Waves)
absorbers, membrane-type, and application in broadcasting studios, [illegible]
attenuation by ceilings, measurement with sinusoidal excitation, **2871**
effects, for radio plays, electroacoustic production of, **3177**
field, near circular transducer, **913**
of disk, effect of finite circular baffle on, **1555**
of infinitely long vibrating cylinder, **1554**
of plane waves, and steady streaming, **1551**
of rectangular piston membrane, **1877**.
second-order, energy/intensity relations in, **2194**
and steady rotational flow, **1552, (C)3166**
between two infinite walls, due to piston source, **1876**
insulation, by means of rubber and steel springs, **608**
measurement of, storage methods of, **3464**
musical, relations between electrical and mechanical production of, **3461**
particle-velocity measurements in liquids with Rayleigh disk, **305**
pressure, multiple-Rayleigh-disk arrangement for measurement of, [illegible]
propagation, effect of meteorological conditions on, review of, **2533**
in gas, **1875**
in granular media, **923**
in labyrinth, application of variational principle in theory of, **2857**
in liquid-filled cylinder with surrounding elastic fluid, **2858**
in rectangular tube, attenuation of, **2537**
in stratified region of troposphere, theory of echoes in, **1880**
in tubes with obstacles or discontinuities, **2193**
radiation pressure, physics of, **1878**
of plane waves at oblique incidence, **6**
radiators, absorption surface of, **1220**
directivity and amplitude distribution of, **1221**
reception, directional, review of methods of, **1574**
underwater, thermal-noise limit of, **106**
reflection, from ocean layers with temperature change, **3463**
of spherical pulse by absorbent infinite plane, **914**
from surfaces with periodic structure, **1895**
rotation of plane of polarization by acoustic gyrator, **1874, 2532**
scattering from sea surface, **2541**
signal-distribution arrangements at South Bank site, London, **23**
source-intensity, in liquids, dependence on absorption coefficient, **2543**
measurement of, **2536**
theory of single-channel transmission, **1229, 1890, 2869**
transmission through partitions, investigation using small-scale models, **609**
velocity, in air, measurement of, at 1 kc/s, **1566**, at 13·5 kc/s, **605**
errors in indirect measurements of, **916**
in liquids, temperature dependence of, measurement of, **1224**
measurement of, properties of water-filled tubes for, **2866**
——**recorders,** magnetic, **2551**
interference effects in recording heads of, **2876**
print-through effect in, **1901**
tape field with ideal and with wide-gap pickup head, **1575**
——**recording,** disk, binaural, two-band system, **2550**
calibration by light-pattern measurements, **2875**
Sound recording, film, using electro-optic crystal, **2209**
magnetic, in cinema-film production, **21**
effect of head and tape constants in, **2555**
on magnastripe film, **2205**, film production for, **2204, 2206, 2207, 2208**, wear of magnetic heads in, **2203**
standardization of technique of, **22**
stereophonic, **1902**
studies on, **3471**
tapes for, high-output, performance of, **1576**, improved, **2553**, measurement of surface induction of, **2552**, mechanical properties of and quality of recording, **20**, noise tests on, **2877**
very-long-period, continuous, apparatus for, **3180**
and reproduction, 53 IRE 19S1 standard on methods of noise measurement in, **1900**
——**reproducers,** disk, pickups for, lateral mechanical impedance of, **3181**
——**reproduction,** disk, measurement of distortion in, **2736**
needle wear in, **(A)316**
electronic automatic volume compression in, **965**
high-quality, circuit and auditorium requirements for, **611**
magnetic, analysis of, **2554**
stereophonic, **1902**
Spectrometer, high-speed, infrared, **1758**
radio. See Analysers, frequency-spectrum.
Spectroscopy, microwave, coaxial cell for, **1317**
applied to determination of nuclear moments, **1008**
at 1–2-mm λ, **2623**
Speech intelligibility, effect of frequency and amplitude distortion on, **10**
perception of, analysis of processes in, **920**
sounds, three-dimensional models for, **11**
typo-sonograph for, **1568**
synthetic, investigation of consonant sounds, **919**
Stability, of control systems, **1489**
criterion, general, for networks, **2231**
frequency, of linear oscillator, effect of noise on, **362**
Stabilization, frequency, in microwave range, **46**
of nonlinear feedback control systems, **1761**
of variable-carrier-frequency servomechanisms, **551**
voltage, corona discharge tubes for, **1136, (D)2803**
improved, with voltage-regulator tube, **837**
review of, **2458**
with series valve control, **2802**
Stabilizers. See Regulators.
Standard frequency transmissions, (See also Frequency standard)
Rugby, **1732**
24-hour service, **1423**
and time signals, WWV, automatic announcing system for, **1731**
world-wide reception of WWV and WWVH, **522**
Standardization, of symbols and circuit diagrams, **3492**
of telecommunications equipment in France, **2526**
Standards, (See also Television)
resistance, absolute determination of ohm, **1426**
and units, electrical-measurement, review of, **1059**
52 IRE 17S1, definitions of terms on receivers, **811**
53 IRE 7S1, on noise measurement, **3055**
53 IRE 11S1, definitions of modulation terms, **2438**
53 IRE 19S1, on noise measurement in sound recording and reproduction, **1900**
53 IRE 22S1, definition of colour terms for television, **1817**
Sun, density and velocity of material in, estimate of, **1982**
distribution of radio brightness at 9·35 kMc/s on, **3272**
research at Kodaikanal observatory on, **392**
Sunspot cycle, 22-year period of, **2304**
Sunspots, effect on geomagnetic activity, **2642**
flares and filaments, observed at Stockholm in 1950 and 1951, **715**
and geomagnetic storms, **2641**
interrelation of numbers and ionosphere critical frequencies for different sunspot cycles, **1350**
magnetic field of, **2303**
periodicity of number variations, **3595**
physical conditions in, deduction of, from spectral data, **1324, 1669**
provisional numbers, April–June 1952, **395**, July–Sept. 1952, **1325**, Oct.–Dec. 1952, **1984**, Jan.–March 1953, **3275**
relative numbers, final, for 1951, **394**
Switches, electronic, using cold-cathode gas-discharge tubes, **288**
in communication engineering, **48**
using multivibrator, **654**
triode, **343**
multichannel, for microwave circuits, **1252**
t.r. and a.t.r., C.F.T.H., for 3-cm radar equipment, **588**
waveguide, rotary, **2241**
Synchronization, (See also Television)
a.f.c., theory of, **3214, (C)3524**
for c.r.o. display of variable voltages, **339**
of LC oscillators, **2940**
of pulsed high-energy ion beams, **1448**

T

Telecommunications, in civil aviation, **3419**
equipment, standardization of, in France, **2526**
in Nyasaland, **1119**
Telecontrol, of broadcasting transmitters, **2762, 2763**
of clocks, by pulses at 1-sec intervals, **1421**
Telegraphy, frequency-shift, on carrier-current telephone lines, **2434**
teleprinter, distortion in, c.r.o. measurement of, **3408**
technical progress in, **2138**
Telemetry, high-speed system of, **3674**
multiplex teletype system of, **1097**
pulsed light-beam system for e.s. accelerator, **794**
review of methods of, **1762**
wire system for transmitter circuits, **2762, 2763**
10-channel pulse-code system of, **498**
23-channel p.p.m. system for rockets, **726, 2404**
Telephone earpieces, suitability for measurements on f.m. tones, **312**
Telephony, (See also Carrier-current systems)
circuits, cable, uniform, determination of primary parameters of, **2556**
multichannel systems, intermodulation noise in, **827**
short-range, ultrasonic system of, **1885**
Television, (See also Aerials; Interference)
adaptation of eye in relation to optics of, **563**
amplifiers, h.f. and i.f., effects of feedback in, **1954**, gain and bandwidth of, **1639**, noise problems of, **1640**
i.f., with bifilar-wound coils, **3735**
with optimum transient response, **3133**
for pickup tube, fluctuation noise in, **1837**
wide-band, factors in design of, **1838**
applications of, industrial and professional, **1844**
in industry, research and education, **1512, 2815**
to operative-surgery demonstration, **1845**
bandwidth reduction in, **1825**
signal compression by recoding, **1154**
techniques for, **1824, 3731**
cameras, auxiliary equipment for, **1165**
B.B.C., with optical view-finder, **856**
in cinematograph-film making, **1830**
conductron, **3128**
effect of tube characteristics and other factors on design of, **854**
image-iconoscope, improvements in, **2167, 3733**, use of electron multipliers in, **855**
image-orthicon target, French origin of, **2808**
with remote control of lens selection and focus, **2164**
signal generation in, **1829, 3433**
small, for high-speed scanning, **853**
storage-type, signal generation in, **1828**
vidicon, performance of, **249**
5 : 1 zoom lens for, **849**
colour, channel width for, **2805**
colorimetry in, **3123**
compatible systems of, **1815**, colorimetric analysis of, **1816**, principles and development of, **3428**, R.C.A., colorimetric analysis of, **3429**
constant-luminance system, gamma correction in, **238**
definitions of terms in, approved, U.S., **561**, I.R.E. standard, **1817**
developments in U.S.A., **2162**
dot-sequential, band-shared systems, improvements in, **(A)240**
flying-spot signal generator, **2807**
frame synchronization for, **236**
fundamental aspects of, **1814**
kinescopes, shadow-mask, 3-gun, **575**
large-screen, eidophor system of, **2474**
methods and colorimetric principles of, **1813**
N.T.S.C. compatible system, effects of noise on, **2467**, field tests of, revised specifications for, **2466**, field tests of, signal generation for, **1822, 2465**, optimum utilization of r.f. channel for, **3431**, receiver for, **1501, 3130**, subcarrier system, mathematical treatment of **3124**, subjective tests of synchronization signal for, **3427**, synchronous demodulator for, **253, 3129, 3436**
phosphor screens for c.r. tubes for, preparation of, **3440**
rotating-screen c.r. tube for reproduction of, **3740**
single- or multi-gun chromatron, **3131**
subjective and objective aspects of colour rendering in, **1818**
survey of, **239**
synchronization in, **2464**
visual problems in, **(AD)1493**
combining filter for common-aerial vision and sound transmission, **1162**
as communication problem, **1820**
control rooms, planning of, **863**
converter, from 405-line to 625-line standard, **2469**
from 819-line to 405-line standard, **3432**
Coronation transmissions, Hinsbeck relay station for, **3425**
technical arrangements for, **2804**
to Western Europe, **3118**, radio and cable network for, **2461**
c.r. tubes, with bent neck, **3737**
characteristics of, **2171**
magnetic deflection system for, ferroxdure magnets in, **862**, field plotting in design of yokes, **256**, with internal pole pieces, **257**, using permanent magnets, **573**
design factors of, **1540**
manufacturing methods for, **1870**
phosphors for, **1869**
steel, development of, **3132**
univoltage e.s. lens for, **1541**
and valves, for television receivers, **1521**
experimental equipment of Radio-Basel, **1509**
field-strength surveys for, at u.h.f., **523**
for 500-W transmitter on the Dôle, Switzerland, **246, 2166**
frequency allocations for France and dependencies, **1827**
in Great Britain, **3732**
history of, **848**
in Italy, activities of study centre for, **3120**
limited-spectrum signals, effects of amplitude and phase distortion on, **1177**
Television, line standard, optimum, as dependent on size of receiving screen, **844**
line timebase, output stages with booster circuit for, **2478**
single-valve, **2814**
links, British network, **242**
cable, Birmingham/Holme-Moss, frequency-translating terminal equipment for, **1149**, Birmingham/Manchester/Holme-Moss, **1147**, in Germany, **2436**, L3, terminal equipment for, **3424**, London/Birmingham, delay equalization of, **1148**, for outside broadcasts, **1145**
cable and radio, in United Kingdom, **1142**
Hamburg/Cologne/Frankfurt, **3426**
London/Birmingham, u.h.f. filters and switches for, **951**
microwave, high-power, mobile, **1159**, Louisville/Nashville, U.S.A., **2463**, portable equipment for, **1158**
nonlinearity in, measurement methods for, **1064**
temporary, for outside broadcasting, **1143**
u.s.w., between Berlin and Hamburg, **1810**
wire and microwave, for 1952 National Political Conventions, **3134**
3·6–5·0-kMc/s, coaxial-line v.m. oscillator valve for, **1211**
mobile equipment of U.S. Army Signal Corps, **1821**
outside broadcasts, in Northern England, **560**
technical arrangements for, **1144**
picture projection with 60-sec delay, **241, 1155**
picture quality, distortion due to echoes, **3441**
relation of to transient response, **3745**
picture signals, energy spectrum of, **234**
present development of, **237**
programmes, engineering technique of, **842, 843**
problems of sound in, **846**
projection, receivers, problems of, **251**
for theatres, c.r.-tube system for, **1835**, design of, **2811**, eidophor system of, **2473**, equipment for, **562**, h.v. generators for, **569**, precision synchronizing system for, **1812**, problems of, **1168, (C)2170, 2472**
receivers, a.c./d.c., and valves for, **1503**
accurately synchronized, incorrect interlacing in, **1498**
adaptation of French 819-line to American 525-line standard, **2471**
a.f.c. systems for, design of, **3119**, testing of, **570**
a.g.c. systems for, **250, 1832, 1833**
blanking circuit for, **572**
British-type, **1495**
constant-input-impedance second detector for, **254**
converter for, **2169**, u.h.f., **861**, 427/45-Mc/s, for Television Society's transmissions, **2809, (C)3434**
d.c. level restoration in, **1500**
deflector-coil construction for, **574**
effects due to cathode-interface impedance in, **2505**
faulty interlacing in, **(D)255**
frame-deflection circuit with voltage-dependent resistor, **3741**
frame-scanning circuits for wide-angle c.r. tubes, **1507**
gamma-control circuit using crystal diodes, **1826**
Ge diodes in, **1505**, as video detectors in, **2475**
grounded-electrode valve circuits for, analysis of, **1632**
input stages of, comparative survey of, **1167**
with intercarrier sound channel, **857, 3734**
mass-production, **3739**, factors affecting design of **1496**
mechanized dip-soldering of, **2710**
performance in presence of interference, **1511**
push-pull amplifiers in video output circuits of, **3743**
reactive timebases for, **860**
reduction of radiation from, **2476**
scanning defects, reduction of, **3439**
Se and Cu_2O rectifiers in, **1502**
slow-acting synchronization circuits in, operation of, **3736**
sound, critical capacitance coupling in, **1831**
superheterodyne, design of, **1504**
synchronizing circuit, flywheel, **1499, 2479, 2480, 3738**, using ECL 80 and EQ 80 valves, **2168**
synchronizing-signal clipper with noise immunity, **252**
transistor circuits for, **2813**
u.h.f. tuner, **1166**, coaxial-cavity, **1952**, design and performance of, **571**, 3-cavity, **1506**
v.h.f.-u.h.f. tuners for, factors affecting design of, **3438**
v.h.f./u.h.f., design of, **1497**
Wireless World design, modernization of, **2810**
625- and 525-line, tests on, **2397**
reception, in fringe areas, community aerials for, **859**
ionospheric influences in, **1176**
modulation distortion in, **260**
storage and picture-difference methods in, **2163**
recording, of cinematograph films, B.B.C. equipment for, **851**
on cinematograph film, and reproduction from, **3125**
various methods of, **847, 2468**
retransmission equipment, Ekco, **258**
scanner for 35-mm film, **852**
scanning-current linearization by negative feedback, **(A)248**
service area of Wenvoe 50-kW transmitter, **1510**
signal-distribution arrangements at South Bank site, London, **23**
standards and channels in S. America, **1494**
stations, B.B.C., **1171**, Kirk o' Shotts and Wenvoe, **244**
'booster', for fringe areas, **1811**
Montreal and Toronto, Canada, **1170**
N.W.D.R., **2148**
100-kW, Sutton Coldfield, **1508**
stereoscopic, practicability of, **2806**
Television, studios, B.B.C., lighting techniques in, **865**
discharge lamps for, **866**
equipment testing with variable-phase synchronizing pulses, **3378**
illumination of, **1164**
lighting equipment for, **864**
at 1951 Radio Exhibition, London, **564**
synchronization technique in, **1153, (C)2161**
systems, noise measurements on, **868**
square-wave testing of, **1754**
transient testing of, **1065**, using sine-squared pulses, **3377**
test equipment, **1823, 2396**
for comparison of line standards, **1753**
grey-scale generator for, **565**
wide-band frequency sweep generator for tests on, **486**
6-waveform generator and display unit for, **1087**

- test-pattern transmission, monoscope for, 850
- transmitters, in Great Britain, selection and testing of sites for, 1172
  - high- and low-level modulation for, comparison of, 567, 568, (D)1163
  - high-power, Holme Moss, design of, 1161
  - mobile, B.B.C., 3127, hinged mast for, 1160
  - Wenvoe, Glamorgan, 3126
  - wide-band amplifiers for, 3744
  - 850-Mc/s, experimental, KC2XCY, 566
  - 10-kW, Nikolassee, Berlin, 245
  - 100-kW, output stage for, 3742
- u.h.f., experimental broadcast to schools, 555
  - monitoring equipment for, 247
- vestigial-sideband system, response to 'sine-squared' step voltage, 1066
- video signal, application of autocorrelation theory to, 3122
  - power density spectrum analysis by autocorrelation, 3121
  - waveform, display apparatus for, 2745
- wire-distribution systems, 1808
  - specification and testing of, 1755

Test equipment, (See also individual instruments; Television)
- cable-fault indicator, 2392
- cable-fault locator, pulse-operated, portable, 3361
- for c.r.o. display of transistor characteristics, 3053
- for f.m. systems, 3664
- for group-delay distortion of transmission system, 1076
- for harmonic response of linear systems, 3374
- insulation tester, electronic, 500-V–10-kV, d.c., 480
- microwave, for magnetron production, 778
- radar, Type-TF890A, 1445
- reference-level, direct-reading, for telephone circuits, 777
- S-band, with frequency-sweep generator, 3671
- for the TD-2 microwave radio relay system, 3063

Thermistors, characteristics and applications of, 948, 3215
- h.f. power measurement with, 1441
- manufacture of, 2240
- resistance of, effect of pressure on, 342

Thermocouples, for radiation measurements, using semiconducting materials, 3376

Thermometers, sensitive radio receivers as, 2761

Thunderstorms, radio location of, recent developments in, 1020

Time constant, concept of, extension of, 2575
- interval recorder, using sawtooth-waveform generator, 152
- signals, schedule of transmissions from Observatoire National, Paris, 2744

Timebases, circular, slow-speed, 673
- line, single-valve, 2814
- negative-feedback, instability in, 2272
- pulse-operated, 1630
- review of, 1631
- sawtooth derivator for c.r.o., 2269

Timers, electronic, 1420
  - spark-type, 455
- ignition-type, for spot-welding machines, 501
- photographic-exposure, with compensation for supply-voltage variations, 789
- reading in seconds or in cycles, 770

Torque measurement, electrical microdynamometer for, 490

Transducers, $BaTiO_3$, circular, bimorph, sensitivity of, 926
  - h.f., with wide-angle beam, design of, 3167
- crystal, graphical aids in interpreting performance of, 2164
- electromechanical, for telemetry, 2412
- magnetostrictive, simple method for constants of, 5

Transductors, input- and power-type, for frequencies of 400 c/s and 1·6 kc/s, 3216
- single-phase, design of, 1254
- 3-phase, for magnetic amplifiers, 949

Transformers, a.f., factors concerning use of, 2577
- balun, balance measurements on, 3663
- double-tuned, unequal-*Q*, design of, 3499
- feeding half-wave rectifier circuit, transient conditions in, 3501
- i.f., coupling coefficient of, meter for, 3658
  - input impedance and transimpedance of, 2578
- impedance, modified exponential line as, 3533
- for infrared chopped-beam systems, for operation at 10 c/s, 942
- production by Technograph etching system, 353
- pulse, peaking, design of, 2233
  - series peaking, design of, 1596
  - turns index for design of, (A)1250, 3500
  - using varying-pitch helical windings, 2234
- voltage, design of, 1599

Transients, in networks, analysis of, 1247
- response of filters and transmission lines, formulae for, 1248

Transistors, (See also Valves, crvstal)
- characteristics of, c.r.o. display of, 1437
- control applications of, 792
- equivalent-circuit diagrams for, 3522
- field-effect, unipolar, 3445, theory of, 879
- filamentary, large current amplifications in, 1516
- Ge, and Ge rectifier, theory of, 2821
  - *p-n*-junction, power, 834
  - *p-n-p*-junction, fused-impurity, 876, 877
  - *p-n-p-n*-junction, equivalent circuit of, 878
  - point-contact, base resistance of, effect of electrode spacing on, 882, control of frequency characteristics and stability of, 884, factors in design of, 2487, for frequencies up to 302 Mc/s, 585, mechanism of, 3331
- in grounded-collector connection, parameters of, 3518
- junction, admittance parameters of, bridges for measurement of at 1 kc/s–1 Mc/s, 3359
  - bandwidth limit of, 3747
  - circuit applications of, 3244
  - effects of space-charge-layer thickness in, 874, (D)3212
  - equivalent circuits for, and analogy with valves, 644
  - frequency variation of current gain in, 890
  - l.f. and m.f. characteristics of, 2489
  - *n-p-n*, properties of, 2490, tetrode, for h.f., 877, 1184
  - *p-n*, current amplification factor for, 2488, theory of noise in, 871
  - *p-n-p*, current gain in, 881
  - pulse response of, 3514
  - symmetrical properties of, circuits based on, 2583
- noise in, circuit problems of, 643
  - measurements of, 887
  - meter for production testing of, 2385
- oscillator circuits using, 45
- parameters of, temperature variation of, 883
- physics of, 265
  - and analogue type of, 746
- point-contact, transient effects in, 2491
  - Type-A, trigger circuit using, 3516
- properties of, and applications of, 1351
  - and circuits for, 44
- review of development and applications of, 873
- Si, *p*-type, measurements on, 2823
  - point-contact, properties of, 2822
- small-signal parameters of, measurement of, 3358
- stabilization of amplifier operation of, 688, (C)3248
- in switching circuits, 3515
- test methods and equipment for, 3053
- theory and applications of, 1957, 2239, 2627, 3021, 3444, 3523
- transformer circuits for, 1287
- use in aircraft equipment, 672
- use in f.m. oscillator, 2938

Transistrons, blocking-layer interaction in and fluctuation statistics for, 566

Transmission lines, (See also Cables)
- balanced, attenuation measurement for, 467
  - unscreened measurement of attenuation of, 159
- coaxial, charts for probe measurements on, 458
  - rectangular, characteristic impedance of, 3474
  - two-dielectric, propagation along, 3185
- condition for distortion-free transmission in, 2560, (D)2561
- conical helix, e.m. wave propagation along, 1973
- constants of, approximate formulae for, 619
- delay, compensated, theory of, 1262
  - for digital computers, 3850
  - elastic-solid, diffraction patterns for, 2574
  - high-characteristic-impedance, for pulses of duration $<1\mu s$, 2857
  - interdigital, for travelling-wave valves, 2828
  - low-frequency, design of, (A)1603, 2920
  - ultrasonic, 2921, magnetostrictive, 2067, vitreous-silica, performance of, 347
- exponential, and their radiation loss, 3187
- fixed-length, as circuit elements, 1272
- helical, for microwave measurements, 779
- helical slit, propagation in, 3476
- h.f., effect of losses in, 3475
- h.v., design of in relation to radio noise level, 927
- impedance of, determination by three-point method, 2733
- $\lambda/4$, short-circuited, input impedance characteristics of, (D)319
- laminated, Clogston-type, theory of, 25, 618, 2562
- load impedance for maximum efficiency, 2219
- long, input impedance and location of nonuniformities of, 1579
- microstrip, and associated components, measurements on, 623, 2214
  - for kMc/s range, 621, 2212
  - simplified theory of, 622, 2213
- multiconductor, with h.f. TEM waves, analysis of, 26
- nonuniform, multiple, theory of, 1581
- short, in u.h.f. techniques, 2917
- surface-wave, with bends, propagation along, 3473
  - dielectric-coated, 1906, single-wire, at 10-cm λ, 3186
  - launching process for, 320
  - possible applications of, 620
  - single-wire, theory of, 1580
  - for 1·7–2·4 kMc/s, 930
- uniform, synthesis of, 2880

Transmitters, (See also Television)
- broadcasting, a.m., at WNEW, for continuous operation, 3746, 1-MW, 2176
  - anode-modulated, distortion in, 262
  - high-power, B.B.C. Third Programme, remote control of, 261

Transmitters, broadcasting, speech-input systems for, 824
  - s.w., 100-kW, 2819
  - unattended, B.B.C., monitoring of, 548
- communication, h.f., 4-channel, Type HC.100, 3135
  - 1-MW, for 14·5–35 kc/s, for U.S. Navy, 821
- harmonic-radiation from output stage of, 2482
- h.f., for aerodromes, 3419
- magnetron, a.m., injection-locked, measurements on, 1060, 2483
- marine, design problems of, 3443
- radiotelegraphy, for mercantile-marine vessels, 2818
  - rounding of signals by use of filters in, 1847
- and receivers, for citizens' radio, 2437
- R/T, s.s.b., for 4–23-Mc/s 4-channel system, 541
- s.s.b., phase-rotation, output analysis and alignment techniques for, 2481
  - for s.w. radio link, independent-sideband drive unit for, 2175
- 300- and 400-kc/s, for Palais de Chaillot translation service, 2794

Troposphere, (See also Atmosphere)
- refractive index of, abacs for computation of, 1670
  - measurement of fluctuations and profiles in, 1341
  - vertical and horizontal gradient over U.S.A., 1991
- upper, and lower stratosphere, over southern England, humidity of, 1671

Tuners, automatic, in microwave receivers, 2130
- coaxial-cavity, 470–890-Mc/s, 1952

Tuning, automatic, of h.f. generators with varying load, 681
- electronic, of r.f. circuits, use of ferrite cores for, 3569

U

Ultrasonic absorption. See Absorption.
- applications, echo-sounding equipment with new indicator, 1092
  - flaw detection, elimination of parasitic echoes in, 492
  - fluid-flow measurement 2084
  - h.f. reciprocating drill for hard brittle materials, 2085
  - light-diffraction apparatus for determination of elastic constants, 3072
  - in metallurgy, 2402
  - in rubber industry, 493
  - testing of materials, using $BaTiO_3$ oscillator, 1756
  - tinning of Al, 800, 801
  - torpedo-depth measurement, 1447, 2401
  - whale location, 1757

Ultrasonics, cavitation investigations, 1560
- energy concentration in, 603
- field intensity, in liquids, thermoelectric method of comparison, 3171
  - probe method of measuring, 2195
- field-investigation method based on starch-iodine reaction, 8
- interference of beams incident on and reflected by plane wall, 1558
- interferometer for measurements in, 1223
- in liquids, review of, 1563
- in short-range telephony, 1885
- in solids, and applications, 1884
  - measurement of velocity, 1561
- transmission through plane absorptive plate immersed in liquid, 2868
- velocity, and absorption in dry CO_2-free air, 7
  - in Ar at pressures up to 950 atm, 1559

Units, and dimensions, of electrical quantities, 86

Ursigrams, European, abbreviated codes for, 2650, 2980, (C)2981

V

Vacuum gauge, ionization, cylindrical, magnetron-type, 3000
  - Penning, degassable, 3001, operation of, 2634
- pumps, diffusion, working fluids for, 1686
  - electronic, 2011, 3320
- technique, clean-up of He in arc discharge, 3604
  - getters, Ba, 2321, powdered Zr, quality estimation for, 3034, thorium powder, 2675
  - ionization method of evacuation, 2011, 3320
  - production and measurement of pressures down to 10^{-10} mm Hg, 3603
  - use of membranes in, 110

Valves, (See also Counter tubes; Discharge tubes; Transistors; Transistrons)
- amplifier, resistive-wall, 2498, 3147
- backward-wave, starting currents in, 3752
- beam-deflection, Type E80T, 2843, in multichannel I.G.O. circuits, 2817
- characteristics of, effect of filament voltage on, 1866
  - fine structure of, 3143
- cold-cathode, recent developments of, 2501
- corona discharge, voltage-stabilizer, measurements on, 3155
- counter, decade, ribbon-beam, 3762
- counter and switching, gas-filled, 296
- and c.r. tubes, for television receivers, 1521
- crystal, diode, Si *p-n*-junction, 905
  - diode and triode, review of characteristics of, 264
  - Ge, 1515
  - Ge-diode, influence of contact and of pulse treatment on, 2179, negative resistance in, 2180, point-contact, transient effects in pulse response of, 872, sealed-in construction, 1849, as video detectors, 2475
  - junction-type fieldistors, 880
- diode, cathode-temperature determination from retarding-field characteristic, 1199
  - conductance and noise-power spectrum of, 1196
  - corrected evaluation of anode current in, 1861
  - effect of V_f on I_a in, 1194
  - influence of initial velocities on electron transit time in, 1193

Valves, diode, planar, extension of Llewellyn's transit-time solution, (D)1862, h.f. admittance with retarding field, 290, plasma equations for electron flow in, 1868
  - with plane inclined electrodes, theoretical investigation of, 2509
  - saturated, stability of, 2511, subminiature valves operated as, 1197, (D)2512
  - space-charge smoothing factor for, (A)291, 1196
  - with W filament, saturation current of, 2518
- diode and triode, low-frequency noise in, 1192
- double-beam, for amplification at 3 kMc/s, 3146
- electrometer, low-frequency noise in measurements of, 1185
- electron-stream, influence of wall admittance, 2498
- emission current in, approximation to 3/2-power law for finite cathode, 3757
- gas-filled, for industrial applications, 295
  - triode, discharge processes in, 1542
- gated-beam, Type-6BN6, as fast coincidence counters, 512
- glow-discharge, cold-cathode, inertia effects in, 903
  - large-current, characteristics of, 3457
  - voltage-regulator, characteristics of, 591, peak-noise characteristics of, 2516
- heaters for, extension of operating-voltage range of, 287
- heptode, Type-DK92, in frequency changer for 3·3–30 Mc/s, 818
- for industry and research, classification of, 587
- klystron, construction, properties, operation and applications of, 596
  - equations of oscillations of beams in, 3144
  - floating-drift-tube, investigation of, 1544
  - gridless, 3-cavity, 5-kW, 1213, 3-cavity, high-power, for λ 10·5 cm, 3161
  - high-power, a.f.c. of, 2942
  - power-amplifier, Type-SAL-39, using space-charge focusing, 595
  - reflex, for cm-wave links, 1546, with coupled resonators, 3160, f.m. distortion in, 1545, oscillation mode and bunching efficiency of, determination of, 3159, Type-R5081 for f.m. at cm λ, design of, 1214, 14·5–17·5-kMc/s, design features of, 2853
  - u.h.f., Type-V42, 15-kW, 1212
- magnetron, application of thermodynamics of irreversible processes to, 2847
  - basic principles of, 1209
  - conductance measurements on, 157
  - currents and space charge in, 3764
  - in cut-off state, effects of h.f. wave in, 594, experimental study of, 1210, space-charge distribution in, 592
  - for dielectric heating at 915 Mc/s, 2850
  - early history of, 2851
  - German, 2852
  - grid-type, for modulation at u.h.f., 2519
  - with interdigital circuit, 2187, design of waveguide-loaded resonator for, 2848
  - inverted and planar, efficiency of, (D)2849
  - l.v., tunable, Type PAX3, for beacons, 2183
  - microwave equipment for production testing of, 778
  - mode interactions in, 593
  - multicavity, natural oscillations and mode changes in, 1543
  - multisegment, theory of, 3158, 3458
  - rising-sun, possibility of generating mm-waves with, 297
  - single-cavity, 'turbator', 2518
  - whole-anode, oscillations in, 904
- matching of by means of resistors, 3563
- oxide-cathode, aged, frequency dependence of mutual conductance of, (A)2838
  - characteristics of, changes of, 3755
- pentode, optimum screen voltage of, 294
  - Type-C3m, for a.f. and r.f., 589
- reliable, specifications for, 270
  - technique of, 272
- reliability of, 271
- resnatron, reflex, u.h.f., theory of, 1207
  - u.h.f., axial-flow, 1208
- retarding-field, motion of electrons in, 3157
- screen-grid, limiting sensitivity of, 1538
- sockets, for industrial equipment, review of, 1860
- space-charge-wave, theory of, 1856
- spiral-beam, for u.h.f. television modulation, 2188, 2500
- subminiature, with filament cathodes, reliability of, 3749
- tetrode, 1-kW, u.h.f., 1206
- thyratron, applications for switching and control, 902
  - grid-circuit reliability of, improvement of, 2517
  - inert-gas, arc drop and deionization time in, 3154
  - small-signal control of, 3218
  - for telephone-circuit engineering, 3156
- transit-time, influence of plasma oscillation in, 1525
- transmission-line, proposals for, 269
- transmitting, heat-transfer data for, 2495
  - high-power, for industrial heating applications, design of, 3759, vapotron, 3451
  - Swiss developments in production of, 1548
- travelling-wave, amplifier, large-signal theory of, 2497, low-noise, 275, 277
  - characteristics in dispersive region of delay line, 2826
  - with corrugated rectangular waveguide, 1186
  - developments in, 1524
  - electronically tuned, 3454
  - excitation of e.m. fields by current waves in, 279
  - experimental verification of theory of, 280
  - helix-impedance measurement on, 3753

Valves, travelling-wave, helix-type, theory of, 3453, 10-W, for 15 cm λ measurements on, 2499
  - interaction of space-charge waves with electron beam in crossed fields, 1526
  - with interdigital delay line, 2828
  - long-beam, magnetic electron optics of, 2827
  - low-noise, 273, (C)2496
  - noise measurements on, 3145
  - phase distortion in, 1855
  - power capacity of, factors affecting, 3751
  - recent developments in, 274
  - reduction of noise factor in, 3754
  - reflex, theory of, 276
  - review of, 2183
  - space-harmonic, 2831, 50-kMc/s, 1187
  - thermal-velocity-spread effect on noise figure of, 3452
  - Type CV2188, for cm-λ radio links, 2829, construction and operation of, 2830
- triode, amplification factor of, 1537
  - amplifier, limiting sensitivity of, 1203
  - conventional, u.h.f. oscillations in, 2271
  - disk seal, grounded-grid, circle diagram for input admittance of, 3564
  - gas-filled, in pulse amplifiers, 2274
  - inherent feedback in, 1865
  - low-frequency noise in, measurements of, 1202
  - oscillator, limiting frequency of, 1201, Type-6AF4, for u.h.f. television receivers, 900
  - planar, design charts for, 2514, positive-grid, current division in, 1533
  - potential distribution between plane accelerating grid and anode, 1534
  - transit-time oscillations in, (D)1200
  - transmitting, u.s.w., Siemens, 1535, 100-kW, with thoriated-tungsten filaments, 2841
  - triple-diode Type-E/U/PABC 80, 1191
  - u.h.f., design of, 1536, Type-Z2103, performance of, 1204, Type 6AJ4, 1205
- triode and tetrode, for coaxial-cable system, 293
- triode-hexode, Type-ECH42, applications of, 590
- tuning-indicator, Type-DM70, for battery or mains receivers, 3456
- u.h.f., C.F.T.H., for 3-cm radar equipment, 588
- use of Ni in, 2357
- use of Ni and Ni-alloys in, 3629
- v.m., coaxial-line, for f.m. radio links, 1211
  - theory of, debunching of electron beams in strong magnetic fields, 3459
- voltage-regulator, dynamic characteristics of, 1871

Vibrations, of air in pipes with internal discontinuities, investigation of, 599, 2193
- measurement of, 790, (D)2400
- nonlinear, iterative method for, 3571

Voltage, direct, measurement by comparison method, 2736
- measurement of, in high-resistance circuit, using single universal meter, 3653
- ratio box, h.v., 1-MΩ, 474
- 50-c/s, stabilized, calibrated, as reference standard, 1424

Voltmeters, using cathode follower and thermocouple, effect of valve nonlinearity in, 1746

  diode-valve, errors in, **780**
  rectifier-type, 1–500-V, 30-c/s–300-Mc/s, **167**
  valve, direct-voltage, high-resistance, for ±500 V, **2078**
    wide-range, using electrometer valve, for ±500 V, **2079**
Volume compression, automatic, electronic, **965**

W

Wattmeters, a.f., thermocouple-type, **2394**
  electronic, for a.c.-network analyser, **3669**
  e.s., portable, design and applications of, **1081**
  h.f., with dry rectifier, **1752**
  microwave, vibration-type, **1442**
  torque-type, for 3-cm microwaves, **1082**
Wave propagation, acoustic. See Sound.
  dispersion of ultrasonic pulse transmitted through water-filled tube, **2538**
  ultrasonic, in viscous liquids, critical λ for, **302**
Wave propagation, e.m., (See also Diffraction; Field strength; Reception; Television; Transmission lines; Waveguides; Waves)
  in anisotropic medium, **3393**
  across boundary separating regions with different complex permittivity, **3688**
  British research with reference to television, survey of, **1109**
  cm-λ, fading on 39-mile optical path over sea, **203**
    in optical range, **3097**
    phenomena on line-of-sight links, **1785**
  comparison of c.w. field intensity and back-scatter delay, **808**
  diagram for calculating transmitter service range, **2414**
  diffraction of, due to earth's curvature, **1776**
    tables of functions occurring in theory of, **1777**
  in dispersive medium, analysis of, **390, 1007**
  fading, random, theory of, **2120**
    scintillation, microwave, frequency of, **3098**
    on u.s.w., due to inversion layers, **3695**
  field-strength fluctuations, at u.h.f., beyond horizon, **1473,** prediction of diurnal variations of, **1112,** due to turbulence on line-of-sight path, **3394**
  ground-wave, l.f., effect of large ground dielectric constant on, **2113**
Wave propagation, e.m., group propagation time, extension of Fermat's principle to, **3592**
  along helices, **388**
  through highly ionized gases, **3268**
  in inhomogeneous medium, **2415**
  in inhomogeneous plasmas, theory of, **712**
  in ionized gas, **198**
  in ionized medium, differential equation for rays in, **1465**
    mean velocity of energy in, **196**
    simplified treatment of wave equation for, **803**
  ionospheric, critical frequencies, for oblique incidence, **2115,** relation to sunspot cycles, **1350**
    cross-modulation in, theory of, **3095**
    of decametre waves in arctic polar regions, **1783**
    disturbance of, relation with geomagnetic activity and solar noise, **3283**
    and fluctuation effects, **1105**
    forecasts for, C.C.I.R.-U.R.S.I. cooperation in, **3092,** comparison of N.B.S. and Spanish methods, **1107,** comparison of Spanish and C.R.P.L. results, **3689,** comparison of Spanish and other methods, **1773**
    over great distances, lateral deflection due to reflection, **520**
    gyro-interaction in, solar influence on, **3693,** at vertical incidence, **2111**
    h.f. and m.f., attenuation characteristics for and application to field-strength calculations, **2774**
    higher-order approximations in, **2108**
    limiting polarization of waves reflected from ionosphere, theory of, **1104**
    oblique-incidence, over equatorial regions, **805,** characteristics of 9-Mc/s pulses during solar eclipse, **2770**
    of plane waves, **2766**
    pulse distortion in, **513**
    ray-path calculations for, **3093, 3691**
    reflection from vertical and horizontal gradients, **2418**
    solution for reflected long waves, **(D)410, 517**
    theoretical group heights of reflection of pulsed 150-kc/s waves, **516**
    v.h.f., review of characteristics of, **2422**
    at v.l.f., l.f. and m.f., review of, **1781**
    at 9·83 Mc/s, fluctuations of azimuth angle, **1774**
  l.f., oblique-incidence pulse measurements at 300 kc/s over 1185-km path, **1474**
    phase-velocity measurements over 177-km land path, **1782**
  magneto-ionic equation for, corrected quasi-transverse approximation to, **514,** physical interpretation of, **515**
  magneto-ionic multiple splitting in, **2114**
  magneto-ionic theory of, **3392**
  magneto-ionic *z*-component, polarization of, **1775**
  matrix analysis of transmission through multilayer dielectric wall, **1668**
  microwave, interaction in gas-discharge plasma, **2637**
  through multilayered media, **90**
  through pair of parallel-wire grids, **3590**
  polar blackouts recorded at Kiruna observatory, **3094**
  polarization of vertically incident 150-kc/s waves, **806**
  reflection, from inhomogeneous medium, **1466**
    from varying media, theory of, **2765**
  scatter-sounding methods of prediction of h.f. transmissions, **201**
  scattered echoes, experiments on, **2776**
  scattered waves in, field strength of, **2775**
  Sommerfeld's surface wave, existence of, **(D)3391**
    nonexistence of, **195, 3686**
  s.w., communication on frequencies exceeding predicted m.u.f. values, **3090**
    long-distance, via meteor-trail reflection, **2117, 2421**
    single-hop via F_2 layer, Delhi to Calcutta, **2116**
  transmission loss in, **1111**
  in transparent periodically stratified medium, **3589**
  tropospheric, in duct of nonuniform height, **1471**
    N.B.S. research programme on, **2768**
    selected references on, **2416**
    and wave mechanics, **2112**
  u.h.f., graphs for, **2118**
    beyond horizon, at 40 Mc/s–4 kMc/s, **1114**
  u.s.w., over the Alps, **3397**
    in Baltic area, and optical refraction, **521**
    and meteorology, **3694**
  v.h.f., COZI skip-distance indicator, **3600**
    diffraction effects of hills, **3091**
    long-distance, multiple bursts of signal in, **2419**
    meteorological effects on, **1784**
    reduction of transmission loss and fading for long paths ove mountainous terrain, **3396**
    in relation to television in United Kingdom, **1110**
  of very long waves, and wave spectrum of lightning, **802, 1772**
  wave-theory field calculation for total reflection, **1006**
  16-kc/s, interpretation of measurements by waveguide theory, **2773**
    by oblique reflection from ionosphere during solar flares, **2769**
  56-Mc/s, scattering from lower ionosphere, **2119**
  85-Mc/s, experimental study of, **2423**
  100-Mc/s, correlation with meteorological effects, **2772**
Waveform, (See also Analysis, frequency)
  analysis, for harmonics up to twelfth, **1427**
  recurrent, high-speed, Type-500 monitor for, **482**
Waveguides, attenuation in and surface roughness of, **1584**
  calculation of excitation of, **2563**
  with capacitive pins, as microwave λ/4 plate, **(C)2215**
Waveguides, circular-section, excitation of, **2564**
    for low-loss multimode long-distance transmission, **1585**
    magic-T units for, **3219**
    short sections of, measurement of TE_{01} attenuation in, **1068**
    with TE_{01} wave, susceptance of circular obstacle in, **2565**
  cylindrical, with coaxial dielectric rod, cut-off frequency of, **2886,** propagation in, **2885**
    containing ferrites, transmission modes in, **1586**
    transients in, **2887**
  designation of waves in, with reference to German 1944 Standards, **2217**
  dielectric, radiation from, **322**
  dielectric and metal, analysis and comparison of, **28**
  dielectric-filled, electron beam in, theory of **382**
  diffraction at plane diaphragms in, **625**
  disk-loaded, concept and measurement of impedance in, **626**
  electroplated, attenuation and surface roughness of, **2881**
  Faraday rotation in, **(C)1232**
  containing ferrites, modes in, **2888**
    properties and applications of, **931**
  filled with two or more dielectrics, propagation in, **1907**
  h.f., relative power-carrying capacity of, **(D)27**
  high-power dummy loads for, **2892**
  impedance matching by means of discontinuities in, **3477**
  inhomogeneously filled, calculation of propagation constants for **(D)624**
  junctions for, symmetrical, scattering matrix of, **66**
    two-port, graphical analysis of, **3191**
  parallel-plane, diaphragm-loaded, propagation in, **3189**
    layered-dielectric, propagation in, **321**
  propagation in, theory of, **1582**
  radiation from, visual observation of, **1231**
  rectangular, diaphragms with slits in, **1583, 2566**
    with longitudinal conducting membrane, field in, **2882**
  rectangular and spherical, slot coupling of, **3193**
  rhombic cross-section, propagation in, **2883**
  rigid, standard sizes of, U.S. specifications for, **2891**
  shielded-dielectric-rod, **2218**
  containing spiral, partly filled with dielectric, theory of, **2884**
  with thick obstacles, impedance-matching properties of, **3190**
  transient phenomena in, **2216**
Wavelength measurement, by spectrometer and interferometer methods, **2384**
Waves, (See also Diffraction; Sound; Transmission lines, surface-wave)
  acoustic, concept of energy of, **2860**
    momentum of, **3165**
    in viscous medium, forces due to, **2536**
  a.m., mechanical synthesis of, **469**
  cm-λ, scattering of by precipitation, **1363**
  e.m., ionosphere-reflected, chart for, **1469**
Waves, e.m., microwave, reflection by metal-plate structures **389**
    and photons, relation between, **709**
    scattering, and attenuation by nonspherical atmospheric particles, **2314,** in inhomogeneous atmosphere, **804, 1468,** by precipitation, **1362**
    standing, measurement of high s.w.r. of, **1070**
    submillimetre, use of Tcherenkov effect for production of, **1970**
    in tubes, theory of, **3555**
    velocity of, proposed use of cylindrical surface-wave resonator for determination of, **3355,** shoran determination of, **1470**
  magnetohydrodynamic, in conducting liquids, **1661**
    generalized formulae for, **2636**
    in ionized He, demonstration of, **89**
    longitudinal, **2635**
    studies of, **1660**
  space-charge, in electron streams, **2486**
  ultrasonic, in liquids, demodulation of, **2864,** measurement of velocity in, **2859**
    in solids, velocity of, **1225**
    visualization of, phase method for, **2865**
Welding, electric, measurement of effective values of currents for, **194**

Z

Zeeman effect, at microwave frequencies, measurement of, **1318**

ERRATA

In "Abstracts and References" throughout the year

Abstract No. 41 Cancel the dagger in the U.D.C. number.
" " 121 In line 4, for 'larger' read 'large'.
" " 384 For '537.533.8' read '537.534.8'.
" " 454 For '621.385.5' read '621.383.5'.
" " 763 In line 9, for '(*f*)*t*' read '*f*(*t*)'.
" " 1377 For 'S. T. Kalashnikov' read 'S. G. Kalashnikov'.
" " 1547 For '621.38(061.4)' read '621.38 : 061.4'.
" " 2328 For 'R. Freymann' read 'R. Freymann, R. Rohmer & B. Hagene'.
" " 2576 In line 9, for 'required' read 'described'.
" " 2894 For 'S. K. Dike' read 'S. H. Dike'.
" " 3015 For '537.311.35' read '537.311.33'.
" " 3095 For '3905' read '3095'.
" " 3408 For '621.018.78' read '621.3.018.78'.

U.D.C. Changes

Cyclotron 621 384.611
Getters 621.3.032.461
Pulse 621.3.018.75

LIST OF JOURNALS

A selection of the journals which are regularly scanned is given below, together with the addresses of publishers or editorial offices and the abbreviations of titles as used in the Abstracts and References. Applications for copies of any journal should be made to the addresses given.

The full title of each journal is given first and is followed by the address, the abbreviated title being shown within parentheses. In a few cases the nature of a journal is indicated, where neither the title nor the address shows it clearly.

A

Acta physica austriaca, Springer Verlag, Wien I, Mölkerbastei 5, Austria. (*Acta phys. austriaca*)

Acta Polytechnica, Royal Swedish Academy of Engineering Sciences, Stockholm, Sweden. (*Acta polyt., Stockholm*)

Acustica, S. Hirzel Verlag, Gotthardstrasse 6, Zürich, Switzerland. (*Acustica*)

Advances in Physics, Taylor & Francis Ltd, Red Lion Court, Fleet Street, London, E.C.4, England. (*Advances Phys.*)

Akustische Beihefte, S. Hirzel Verlag, Gotthardstrasse 6, Zürich, Switzerland. (*Akust. Beihefte*)

Alta Frequenza, Associazione Elettrotecnica Italiana, Milano (202), Via S. Paolo 10, Italy. (*Alta Frequenza*)

Annalen der Physik, J. A. Barth, Leipzig C1, Salomonstrasse 18B, Germany. (*Ann. Phys. Lpz.*)

Annales de Géophysique, Service des Publications du C.N.R.S., 45 rue d'Ulm, Paris 5^e, France. (*Ann. Géophys.*)

Annales de Physique, Masson & Cie, 120 Boulevard Saint-Germain, Paris 6^e, France. (*Ann. Phys., Paris*)

Annales de Radioélectricité, 10 rue Carducci, Paris 19^e, France. (*Ann. Radioélect.*)

Annales des Télécommunications, 3 & 5 Boulevard Pasteur, Paris 15^e, France. (*Ann. Télécommun.*)

Annali di Geofisica, Istituto Nazionale di Geofisica, Città universitaria, Roma, Italy. (*Ann. Geofis.*)

Applied Scientific Research, Martinus Nijhoff, Lange Voorhout 9, The Hague, Netherlands. (*Appl. sci. Res.*)

Archiv der elektrischen Übertragung, S. Hirzel Verlag, Stuttgart, Germany. (*Arch. elekt. Übertragung*)

Archiv für Elektrotechnik, Springer Verlag, Heidelberg, Neuenheimer Landstrasse 24, Germany. (*Arch. Elektrotech.*)

Archiv für Meteorologie Geophysik und Bioklimatologie, Series A, Springer Verlag, Wien I, Mölkerbastei 5, Austria. (*Arch. Met., Wien*)

Archiv für technisches Messen, R. Oldenbourg Verlag, München, Lotzbeckstrasse 2b, Germany. (*Arch. tech. Messen*)

Arkiv för Fysik, published for Royal Swedish Academy of Sciences by Almqvist & Wiksells Boktryckeri A.B., Stockholm, Sweden. (*Ark. Fys.*)

A.T.E. Journal (incorporating Strowger Journal), Automatic Telephone & Electric Co., Strowger Works, Liverpool 7, England. (*A.T.E. J.*)

Audio Engineering, Radio Magazines Inc., 10 McGovern Avenue, Lancaster, Pa., U.S.A (*Audio Engng, N.Y.*)

Australian Journal of Applied Science, Commonwealth Scientific and Industrial Research Organization, 314 Albert Street, East Melbourne C2, Australia. (*Aust. J. appl. Sci.*)

Australian Journal of Physics (formerly **Australian Journal of Scientific Research Series A**), Commonwealth Scientific and Industrial Research Organization, 314 Albert Street, East Melbourne C2, Australia. (*Aust. J. Phys.*)

A.W.A. Technical Review, Amalgamated Wireless (Australasia) Ltd, Sydney, Australia. (*A.W.A. tech. Rev.*)

B

B.B.C. Quarterly, British Broadcasting Corporation, 35 Marylebone High Street, London, W.1, England. (*B.B.C. Quart.*)

Beama Journal, British Electrical and Allied Manufacturers' Association, 36 Kingsway, London, W.C.2, England. (*Beama J.*)

Bell Laboratories Record, 463 West Street, New York 14, N.Y., U.S.A. (*Bell Lab. Rec.*)

Bell System Technical Journal, American Telephone and Telegraph Company, 195 Broadway, New York 7, N.Y., U.S.A. (*Bell Syst. tech. J.*)

British Journal of Applied Physics, 47 Belgrave Square, London, S.W.1, England. (*Brit. J. appl. Phys.*)

Brown Boveri Review, Baden, Switzerland. (*Brown Boveri Rev.*)

Bulletin de l'Académie des Sciences de l'U.R.S.S., (*a*) série physique, (*b*) série géophysique, (*c*) classe sciences techniques, Academy of Sciences, Moscow, U.S.S.R. (In Russian.) (*Bull. Acad. Sci., U.R.S.S.,* (*a*) *sér. phys.,* (*b*) *sér. géophys.* (*c*) *tech. Sci.*)

Bulletin de l'Association suisse des Électriciens, S.A. Fachschriften-Verlag and Buchdruckerei, Stauffacherquai 36–40, Zurich 4, Switzerland. (*Bull. schweiz. elektrotech. Ver.*)

Bulletin de la Société française des Electriciens, 55 Quai des Grands-Augustins, Paris 6^e, France. (*Bull. Soc. franç. Elect.*)

C

Câbles et Transmission, Sotelec, 16 rue de la Baume, Paris 8^e, France. (*Câbles & Transm.*)

Canadian Journal of Physics, National Research Council, Ottawa, Canada. (*Canad. J. Phys.*)

Chalmers tekniska Högskolas Handlingar, N. J. Gumperts Förlag, Göteborg, Sweden. (*Chalmers tek. Högsk. Handl.*)

Communication Engineering, The Publishing House, Great Barrington, Mass., U.S.A. (*Commun. Engng*)

Communication News, Philips Telecommunications Industries, Hilversum, Netherlands. (*Commun. News*)

Communications on Pure and Applied Mathematics, Interscience Publishers Inc., 250 Fifth Avenue, New York 1, N.Y., U.S.A. (*Commun. pure appl. Math.*)

Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences, Gauthier-Villars, 55 Quai des Grands-Augustins, Paris 6^{e}, France. (*C.R. Acad. Sci., Paris*)

Comptes Rendus (Doklady) de l'Académie des Sciences de l'U.R.S.S., Academy of Sciences, Moscow, U.S.S.R. (In Russian.) (*C.R. Acad. Sci. U.R.S.S.*)

E

Electrical Communication, International Telephone and Telegraph Corporation, 67 Broad Street, New York 4, N.Y., U.S.A. (*Elect. Commun.*)

Electrical Engineering, Journal of the American Institute of Electrical Engineers, 500 Fifth Avenue, New York 36, N.Y., U.S.A. (*Elect. Engng, N.Y.*)

Electrical Journal (formerly **Electrician**), Bouverie House, 154 Fleet Street, London, E.C.4, England. (*Elect. J.*)

Electrical Manufacturing, 1250 Sixth Avenue, New York 20, N.Y., U.S.A. (*Elect. Mfg*)

Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, England. (*Elect. Times*)

Electronic Application Bulletin, N.V. Philips Gloeilampenfabrieken, Eindhoven, Netherlands. (*Electronic Applic. Bull.*)

Electronic Engineering, 28 Essex Street, London, W.C.2, England. (*Electronic Engng*)

Electronics, 99–129 North Broadway, Albany 1, N.Y., U.S.A. (*Electronics*)

Elektrotechnik und Maschinenbau, Journal of the Elektrotechnischer Verein Österreichs, Springer Verlag, Wien I, Mölkerbastei 5, Austria. (*Elektrotech. u. Maschinenb.*)

Elektrotechnische Zeitschrift, Edition A & B, VDE-Verlag G.m.b.H., Frankfurt/Main, Osthafenplatz 6, Germany. (*Elektrotech. Z.*)

Endeavour, Imperial Chemical Industries, Millbank, London, S.W.1, England. (*Endeavour*)

Engineer, 28 Essex Street, London, W.C.2, England. (*Engineer, Lond.*)

Engineering, 35 & 36 Bedford Street, London, W.C.2, England. (*Engineering, Lond.*)

Ericsson Review, Stockholm 32, Sweden. (*Ericsson Rev.*)

F

Fernmeldetechnische Zeitschrift, Vieweg & Sohn, Braunschweig, Burgplatz 1, Germany. (*Fernmeldetech. Z.*)

Frequenz, Schiele & Schön, Berlin, S.W.29, Boppstrasse 10, Germany. (*Frequenz*)

Funk und Ton, Verlag für Radio-Foto-Kinotechnik G.m.b.H., Berlin-Borsigwalde, Eichborndamm 141–167, Germany. (*Funk u. Ton*)

G

G.E.C. Journal, General Electric Company, Magnet House, Kingsway, London, W.C.2, England. (*G.E.C. J.*)

G.E.C. Telecommunications, General Electric Company Ltd, Coventry, England. (*G.E.C. Telecommun.*)

General Electric Review, General Electric Company, 1 River Road, Schenectady 5, N.Y., U.S.A. (*Gen. Elect. Rev.*)

General Radio Experimenter, General Radio Company, 275 Massachusetts Avenue, Cambridge 39, Mass., U.S.A. (*Gen. Radio Exp.*)

H

Helvetica Physica Acta, Journal of the Société suisse de Physique, Éditions Birkhäuser, Bâle, Switzerland. (*Helv. phys. Acta*)

HF, 55 rue Defacqz, Brussels, Belgium. (*HF, Brussels*)

I

Indian Journal of Physics (and Proceedings of the Indian Association for the Cultivation of Science), 210 Bowbazer Street, Calcutta, India. (*Indian J. Phys.*)

J

Journal of the Acoustical Society of America, American Institute of Physics, 57 East 55th Street, New York 22, N.Y., U.S.A. (*J. acoust. Soc. Amer.*)

Journal of Applied Physics, American Institute of Physics, 57 East 55th Street, New York 22, N.Y., U.S.A. (*J. appl. Phys.*)

Journal of Atmospheric and Terrestrial Physics, Pergamon Press Ltd, 242 Marylebone Road, London, N.W.1, England. (*J. atmos. terr. Phys.*)

Journal of the Audio Engineering Society, P.O. Box 12, Old Chelsea Station, New York 11, N.Y., U.S.A. (*J. audio Engng Soc.*)

Journal of the British Institution of Radio Engineers, 9 Bedford Square, London, W.C.1, England. (*J. Brit. Instn Radio Engrs*)

Journal of the Franklin Institute, Prince and Lemon Streets, Lancaster, Pa, U.S.A. (*J. Franklin Inst.*)

Journal of Geophysical Research, 5241 Broad Branch Road, N.W., Washington 15, D.C., U.S.A. (*J. geophys. Res.*)

Journal of the Indian Institute of Science, Indian Institute of Science, Bangalore 3, India. (*J. Indian Inst. Sci.*)

Journal of the Institute of Navigation, John Murray Ltd, 50 Albemarle Street, London, W.1, England. (*J. Inst. Nav.*)

Journal of the Institution of Engineers, Australia, Science House, Gloucester & Essex Streets, Sydney, Australia. (*J. Instn Engrs, Aust.*)

Journal of Mathematics and Physics, Massachusetts Institute of Technology, Cambridge 39, Mass., U.S.A. (*J. Math. Phys.*)

Journal of the Optical Society of America, American Institute of Physics, 57 East 55th Street, New York 22, N.Y., U.S.A. (*J. opt. Soc. Amer.*)

Journal of the Physical Society of Japan, Maruzen Publishing Co., P.O. Box 605 Central, Tokyo, Japan. (*J. phys. Soc. Japan*)

Journal de Physique et le Radium, 12 place Henri-Bergson, Paris 8^{e}, France. (*J. Phys. Radium*)

Journal of Research of the National Bureau of Standards, U.S. Government Printing Office, Washington, D.C., U.S.A. (*J. Res. nat. Bur. Stand.*)

Journal of Scientific Instruments, 47 Belgrave Square, London, S.W.1, England. (*J. sci. Instrum.*)

Journal of the Society of Motion Picture and Television Engineers, 40 West 40th Street, New York 18, N.Y., U.S.A. (*J. Soc. Mot. Pict. Televis. Engrs*)

Journal of the Television Society, 164 Shaftesbury Avenue, London, W.C.2, England. (*J. Televis. Soc.*)

M

Marconi Review, Marconi House, Chelmsford, England. (*Marconi Rev.*)

Materials and Methods, Reinhold Publishing Corporation, 330 West 42nd Street, New York 36, N.Y., U.S.A. (*Mater. & Meth.*)

Metal Industry, Louis Cassier Company Ltd, Dorset House, Stamford Street, London, S.E.1, England. (*Metal Ind., Lond.*)

Metal Treatment, 49 Wellington Street, London, W.C.2, England. (*Metal Treatm.*)

Metallurgia, 31 King Street West, Manchester 3, England. (*Metallurgia, Manchr*)

Meteorological Magazine, His Majesty's Stationery Office, York House, Kingsway, London, W.C.2, England. (*Met. Mag., Lond.*)

Microtecnic, 23 Avenue de la Gare, Lausanne, Switzerland. (*Microtecnic*)

Modern Plastics, Breskin Publications, Emmett Street, Bristol, Conn., U.S.A. (*Mod. Plast.*)

Monthly Notices of the Royal Astronomical Society, Burlington House, London, W.1, England. (*Mon. Not. R. astr. Soc.*)

N

Nachrichten Technik, V.E.B. Verlag Technik, Berlin N.W.7, Unter den Linden 12, Germany. (*NachrTech.*)

Nature, Macmillan & Co. Ltd, St. Martin's Street, London, W.C.2, England. (*Nature, Lond.*)

Naturwissenschaften, Springer Verlag, Heidelberg, Neuenheimer Landstrasse 24, Germany. (*Naturwissenschaften*)

Nucleonics, 330 West 42nd Street, New York 36, N.Y., U.S.A. (*Nucleonics*)

Nuovo Cimento, Editore Nicola Zanichelli, Bologna, Via Irnerio 34, Italy. (*Nuovo Cim.*)

O

Observatory, Royal Observatory, Herstmonceux Castle, Hailsham, Sussex, England. (*Observatory*)

Onde électrique, 40 rue de Seine, Paris 6^{e}, France. (*Onde élect.*)

Optik, Wissenschaftliche Verlagsgesellschaft, Stuttgart 1, Postfach 40, Germany. (*Optik, Stuttgart*)

Österreichische Zeitschrift für Telegraphen- Telephon- Funk- und Fernsehtechnik, Springer Verlag, Wien I, Mölkerbastei 5, Austria. (*Öst. Z. Telegr. Teleph. Funk Fernsehtech.*)

P

Philips Research Reports, N.V. Philips Gloeilampenfabrieken, Eindhoven, Netherlands. (*Philips Res. Rep.*)

Philips Technical Review (as for **Philips Research Reports**) (*Philips tech. Rev.*)

Philosophical Magazine, Taylor and Francis Ltd, Red Lion Court, Fleet Street, London, E.C.4, England. (*Phil. Mag.*)

Philosophical Transactions of the Royal Society, Cambridge University Press, Bentley House, London, N.W.1, England. (*Phil. Trans.*)

Physica, Journal of the Dutch Physical Society, Bijlhouwerstraat 6, Utrecht, Netherlands. (*Physica*)

Physical Review, 57 East 55th Street, New York 22, N.Y., U.S.A. (*Phys. Rev.*)

Post Office Electrical Engineers' Journal, Engineer-in-Chief's Office, Alder House, Aldersgate Street, London, E.C.1, England. (*P.O. elect. Engrs' J.*)

Poste e Telecomunicazioni, Ministero P.T., Viale Trastevere 189, Roma, Italy. (*Poste e Telecomunicazioni*)

Proceedings of the Cambridge Philosophical Society, Cambridge University Press, Bentley House, London, N.W.1, England. (*Proc. Camb. phil. Soc.*)

Proceedings of the Institute of Radio Engineers, 1 East 79th Street, New York 21, N.Y., U.S.A. (*Proc. Inst. Radio Engrs*)

Proceedings of the Institution of Electrical Engineers, Parts I, II, III and IV, Savoy Place, London, W.C.2, England. (*Proc. Instn elect. Engrs*)

Proceedings of the Institution of Radio Engineers, Australia, Science House, Gloucester Street, Sydney, N.S.W., Australia. (*Proc. Instn Radio Engrs Aust.*)

Proceedings of the National Electronics Conference, 852 East 83rd Street, Chicago 19, Illinois, U.S.A. (*Proc. nat. Electronics Conf., Chicago*)

Proceedings of the Physical Society, 1 Lowther Gardens, Prince Consort Road, London, S.W.7, England. (*Proc. phys. Soc.*)

Proceedings of the Radio Club of America, 11 West 42nd Street, New York, N.Y., U.S.A. (*Proc. Radio Cl. Amer.*)

Proceedings of the Royal Society, Cambridge University Press, Bentley House, London, N.W.1, England. (*Proc. roy. Soc.*)

Q

QST, American Radio Relay League Inc., 38 La Salle Road, West Hartford, 7, Conn., U.S.A. (*QST*)

Quarterly of Applied Mathematics, Brown University, Providence 12, R.I., U.S.A. (*Quart. appl. Math.*)

Quarterly Journal of Mathematics, Oxford University Press, Amen House, London, E.C.4, England. (*Quart. J. Math.*)

R

Radio Technical Digest (Édition française), 122 Boulevard Murat, Paris 16^{e}, France. (*Radio tech. Dig., Édn franç.*)

Radio Technik, Wien VI, Mariahilferstrasse 71, Austria. (*Radio Tech., Vienna*)

Radio & Television News, Ziff Davis Publishing Company, 366 Madison Avenue, New York, N.Y., U.S.A. (*Radio & Televis. News*)

RCA Review, RCA Laboratories Division, Princeton, N.J., U.S.A. (*RCA Rev.*)

Report on Ionosphere Research in Japan, Maruzen Publishing Co., P.O. Box 605 Central, Tokyo, Japan. (*Rep. Ionosphere Res. Japan*)

Reports on Progress in Physics, The Physical Society, 1 Lowther Gardens, Prince Consort Road, London, S.W.7, England. (*Rep. Progr. Phys.*)

Research, Butterworth's Scientific Publications Ltd, 88 Kingsway, London W.C.2, England. (*Research, Lond.*)

Review of Scientific Instruments, 57 East 55th Street, New York 22, N.Y., U.S.A. (*Rev. sci. Instrum.*)

Reviews of Modern Physics, 57 East 55th Street, New York 22, N.Y., U.S.A. (*Rev. mod. Phys.*)

Revista de Telecomunicación, Palacio de Comunicaciones, Madrid, Spain. (*Rev. Telecomunicación, Madrid*)

Revista Telegrafica Electronica, Arbó Editores, Buenos Aires, Argentina. (*Rev. telegr. Electronica, Buenos Aires*)

Revue générale de l'Électricité, 12 place Henri Bergson, Paris 8^{e}, France. (*Rev. gén. Élect.*)

Revue d'Optique, 3 & 5 Boulevard Pasteur, Paris 15^{e}, France. (*Rev. d'Optique*)

Revue scientifique, 4 rue Pomereu, Paris 16^{e}, France. (*Rev. sci., Paris*)

Revue technique Compagnie française Thomson-Houston, 173 Boulevard Haussmann, Paris, France. (*Rev. tech. Comp. franç. Thomson-Houston*)

Ricerca scientifica, Roma, Piazza della Libertà 10, Italy. (*Ricerca sci.*)

R.S.G.B. Bulletin, New Ruskin House, Little Russell Street, London, W.C.1, England. (*R.S.G.B. Bull.*)

S

Schweizer Archiv für angewandte Wissenschaft und Technik, Buchdruckerei Vogt-Schild, Solothurn, Switzerland. (*Schweiz. Arch. angew. Wiss. Tech.*)

Science Reports of the Research Institutes Tohoku University, Series B, Tohoku University, Sendai, Japan. (*Sci. Rep. Res. Inst. Tohoku Univ., Ser. B*)

Scientific Monthly, 10 McGovern Avenue, Lancaster, Pa, U.S.A. (*Sci. Mon.*)

Sylvania Technologist, Lawrence Street, Flushing, N.Y., U.S.A. (*Sylvania Technologist*)

T

Technical News Bulletin of the National Bureau of Standards, U.S. Government Printing Office, Washington 25, D.C., U.S.A. (*Tech. News Bull. nat. Bur. Stand.*)

Technische Hausmitteilungen des Nordwestdeutschen Rundfunks, Nordwestdeutscher Rundfunk, Hamburg 13, Rothenbaumchaussee 132, Germany. (*Tech. Hausmitt. NordwDtsch. Rdfunks*)

Technische Mitteilungen, Journal of the Swiss Post Office, Direction générale PTT, Berne, Speichergasse 6, Switzerland. (*Tech. Mitt. schweiz. Telegr.-TelephVerw.*)

Tele-Tech, 480 Lexington Avenue, New York 17, N.Y., U.S.A. (*Tele-Tech*)

Telefunken Zeitung, Telefunken G.m.b.H., Berlin S.W.61, Mehringdamm 32–34, Germany. (*Telefunken Ztg*)

Télévision, 9 rue Jacob, Paris 6^{e}, France. (*Télévision*)

Tellus, Lindhagensgatan 124, Stockholm, Sweden. (*Tellus*)

Tijdschrift van het Nederlands Radiogenootschap, Frans van Mierisstraat 61, Amsterdam-Z., Netherlands. (*Tijdschr. ned. Radiogenoot.*)

Toute la Radio, 9 rue Jacob, Paris 6^{e}, France. (*Toute la Radio*)

Transactions of the American Geophysical Union, 1530 P Street, N.W., Washington 5, D.C., U.S.A. (*Trans. Amer. geophys. Union*)

Transactions of the American Institute of Electrical Engineers, 33 West 39th Street, New York 18, N.Y., U.S.A. (*Trans. Amer. Inst. elect. Engrs*)

Transactions of the Institute of Radio Engineers, 1 East 79th Street, New York 21, N.Y., U.S.A. (*Trans. Inst. Radio Engrs*)

TSF et TV, 40 rue de Seine, Paris 6^{e}, France. (*TSF et TV*

V

Le Vide, Journal of the Société française des Ingénieurs Techniciens du Vide, 44 rue de Rennes, Paris 6^{e}, France. (*Le Vide*)

W

Weather, 49 Cromwell Road, London, S.W.7, England. (*Weather*)

Wireless Engineer, Dorset House, Stamford Street, London, S.E.1, England. (*Wireless Engr*)

Wireless World, (as for **Wireless Engineer**). (*Wireless World*)

Z

Zeitschrift für angewandte Mathematik und Physik, Éditions Birkhäuser, Bâle 10, Switzerland. (*Z. angew. Math. Phys.*)

Zeitschrift für angewandte Physik, Springer Verlag, Heidelberg, Neuenheimer Landstrasse 24, Germany. (*Z. angew. Phys.*)

Zeitschrift für Meteorologie, Akademieverlag G.m.b.H., Berlin N.W.7, Schiffbauerdamm 19, Germany. (*Z. Met.*)

Zeitschrift für Naturforschung, Tübingen, Mathildenstrasse 20, Germany. (*Z. Naturf.*)

Zeitschrift für Physik, Springer Verlag, Heidelberg, Neuenheimer Landstrasse 24, Germany. (*Z. Phys.*)

Zhurnal eksperimentalnoi y teoreticheskoi Fiziki, Academy of Sciences, Moscow, U.S.S.R. (*Zh. eksp. teor. Fiz.*)

Zhurnal tekhnicheskoi Fiziki, Academy of Sciences, Moscow, U.S.S.R. (*Zh. tekh. Fiz.*)